RTS, LLC

Russom Technical Services, LLC

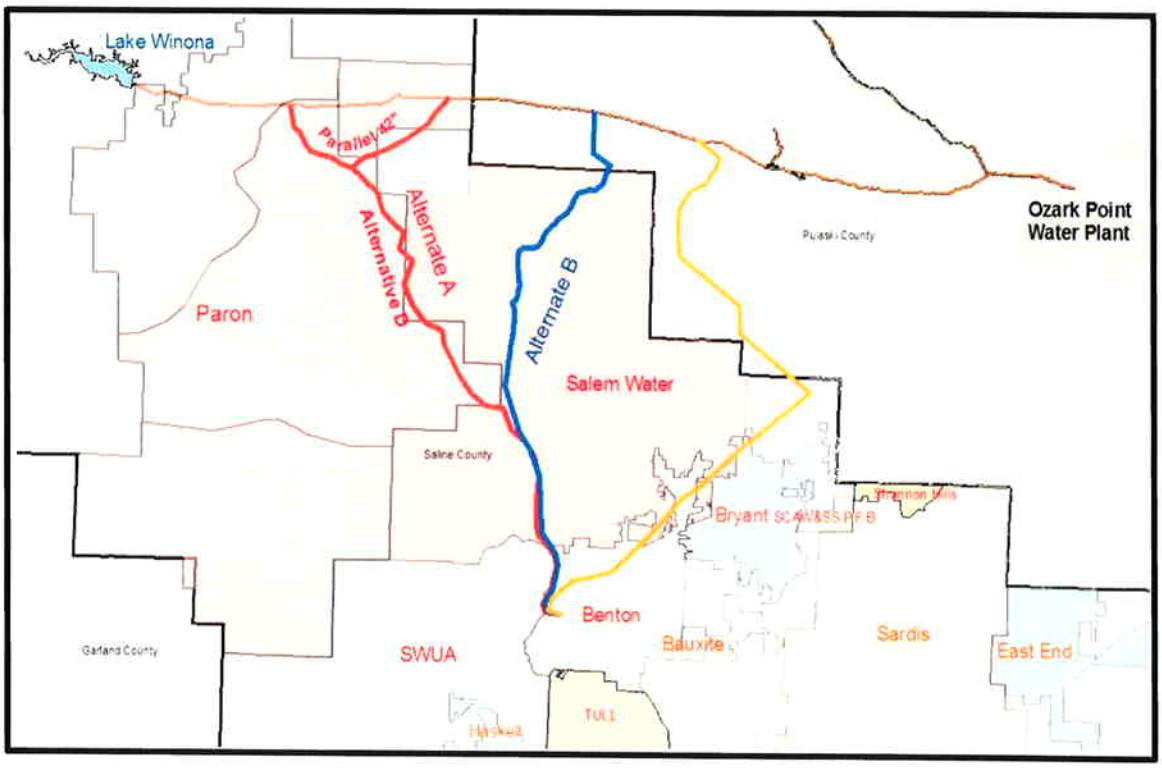
STUDY – LONG TERM WATER SUPPLY

FOR

SALINE WATERSHED ALLIANCE (SWA)

AND

CENTRAL ARKANSAS WATER (CAW)



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STATE OF ARKANSAS
REGISTERED PROFESSIONAL ENGINEER
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Table of Contents

1. Executive Summary

a. Cost Estimates

Based on computer hydraulic modeling thus far, CAW could easily sell raw water that was not previously available for sale. The modeling shows a connection on the Winona line close to the lake will allow more water to be taken from the lake than is presently available in the hydraulically limited 39-inch raw water pipeline. At the same time, as CAW continues to sell water, it accelerates their timeline for an additional source. For CAW to have some assurance that all entities are in partnership with them on obtaining this next future supply would not seem to be an unreasonable request. For this reason the following recommendations are made:

- MAWA continue to be supported by all members. In addition,
- Each participant in this report should set up a mechanism whereby money is set aside for future water from Lake Ouachita.

This is presently being done by CAW, but there could be some reluctance by SWA members to all money being paid to CAW without some say in how it is spent. A way to overcome this would be for:

- All entities to collect this money and then set it aside for future source. The money then could only be withdrawn for the purpose of a "shared" source.

The table below shows the cost summary for four different alternatives as well as a cost comparison for obtaining the same amount of water from Lake Ouachita.

ALTERNATIVES	DESCRIPTION	COST
ALTERNATIVE A	12 MGD FROM LAKE WINONA	$16,864,613
ALTERNATIVE B	12 MGD FROM LAKE WINONA	$17,467,053
ALTERNATIVE C	12 MGD FROM LAKE WINONA	$19,925,529
ALTERNATIVE D	6 MGD FROM LAKE WINONA	$9,311,839
OUACHITA	12 MGD FROM LAKE OUACHITA	$34,474,310

* all alternatives would require treatment plant expansions

As shown in Alternative D, the modeling indicates that it is possible to deliver between 6 and 7 MGD of raw water to the Benton Water Plant while still delivering 22 MGD of raw water to CAW's Ozark Point Water Treatment Plant. The estimated cost of the pipeline

from the Winona raw water line at Paron to the Benton Plant does not include plant expansion costs.

As shown in Alternatives A, B and C, the modeling also indicates the possibility of delivering 12 MGD of raw water to the Benton Water Plant. This option requires a section of parallel 42 inch pipe on the Lake Winona main.

Plant expansion costs at the Benton Water Plant are estimated as follows:

DESCRIPTION	QUANTITY	UNIT	COST/UNIT	TOTAL
12 MGD UPGRADE TO BENTON PLANT * - **	12 MGD			$9,000,000
ENGINEERING	11	%		$990,000
LAND ACQUISITION	40	Ac.	$15,000	$600,000
CONTINGENCIES	10	%		$1,059,000
ADMIN. & LEGAL	1%	%		$116,490
TOTAL				**$11,765,490**

* - first 6 MGD upgrade is based on re-rating existing filters from 2gpm/sq. ft. to 3 gpm/sq. ft.
** - Next 6 MGD upgrade requires filters, basins, and clearwell

DESCRIPTION	QUANTITY	UNIT	COST/UNIT	TOTAL
6 MGD UPGRADE TO BENTON PLANT *		6 MGD		$3,000,000
ENGINEERING	11	%		$330,000
LAND ACQUISITION	40	Ac.	$15,000	$600,000
CONTINGENCIES	10	%		$393,000
ADMIN. & LEGAL	1%	%		$43,230
TOTAL				**$4,366,230**

* - 6 MGD upgrade is based on re-rating existing filters from 2gpm/sq. ft. to 3 gpm/sq. ft.

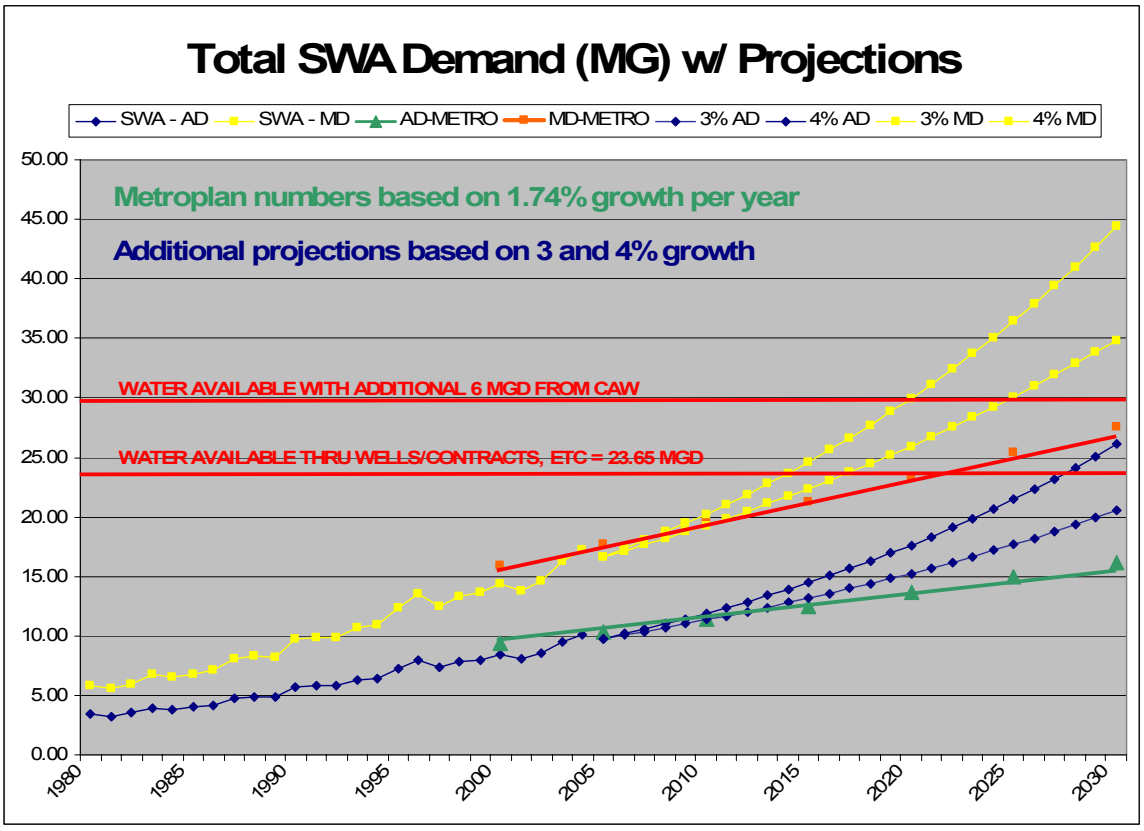
To construct a new 12 MGD plant either along the Lake Winona pipeline right of way or at Lake Ouachita is estimated as follows:

DESCRIPTION	QUANTITY	UNIT	COST/UNIT	TOTAL
CONVENTIONAL TREATMENT PLANT *	12 MGD			$17,400,000
ENGINEERING	11	%		$1,914,000
LAND ACQUISITION	40	Ac.	$15,000	$600,000
CONTINGENCIES	10	%		$1,991,400
ADMIN. & LEGAL	1%	%		$219,054
TOTAL				**$22,124,454**

* - CONVENTIONAL TREATMENT, HIGH SERVICE PUMPS, 5 MG CLEARWELL

b. When is additional water needed

The graph below is a summary of demands for all members of SWA with three growth projections from 2005 forward.



From Metroplan's projections, Saline County is expected to grow at 1.74% per year. Many parts of Saline County have experienced more growth. For this reason, there are two different growth projections shown. One is 3% and one is 4%. It should also be noted that, in this graph, all water available to SWA members is summed up without regard to whom gets how much. You can see that this additional 6 MGD from CAW would be sufficient until 2020 based on 4% growth. Also note that in this graph no flow from Lake Norrell or the Saline River is assumed. In fact, unless there is a catastrophe, another 6 MGD should be available from Lake Norrell or the Saline River.

c. Additional recommendations

As a point of reference, in the UALR report, it was noted that:

- *"The engineering study completed for Benton in 2002 by AFI Consulting Engineers placed the cost of a pipeline from Lake Ouachita at $37,000,000. This estimate is considerably lower since it involved a smaller pipeline project to serve as a supplementary source for Benton only and did not include a treatment facility in the cost estimate".*

As can be seen in the estimates above, due to the cost of a plant adequate in size to treat and deliver all of the available water either to SWA or CAW, the treated water option does not appear to be viable. This would not prohibit SWA from constructing a new plant at Paron and delivering all treated water to SWA. The Benton Water plant seems to be in the geographic center of the largest water usage. At the same time, the fact remains that Benton still owns the plant and there could be some reluctance by other members of SWA to participate in the cost of a line and treatment plant expansion. For this reason,

- There should be some mechanism set up whereby the ownership of the raw water pipeline, the existing plant (and future expansions), as well as Chenault Reservoir, is shared.
- The cost of water **at the plant** should cost the same to each member that participates. This does not mean that each entity can use the other entities distribution system for delivery.
- If SWA enters into a raw water contract with CAW, both parties should make sure that they have a clear understanding of who gets what quantity of water if there is a drought of record and it is necessary to reduce the taking of water back to the safe yield (27 MGD) or less.

It is interesting to note that when UALR delivered their study to Saline County, the comment was made that:

- *"As distasteful as it may seem to some individuals within Saline County, others recognize that finding an affordable source of clean water for the next hundred years may require Saline County to build a relationship of some kind with CAW, at least to defray the costs of building a pipeline to Lake Ouachita or some other water source".*

In fact, 5 of the 11 member of SWA already have contracts with CAW. It could be argued that CAW has not been a good neighbor to SWA because they have been entering into individual contracts with water systems in lieu of a single contract with all members of SWA. It has created a situation that keeps individual systems looking for water when they need it as opposed to the group working together as UALR recommended.

UALR also commented that:

- *"We soon concluded that even though creating a true countywide water system had merits, it was a politically untenable option…..any workable solution, therefore, must balance coordination and efficiencies of scale with preservation of autonomy of existing water systems".*

Perhaps this was, or maybe still, is a *politically untenable option*. Nevertheless, there will come a point in time that it will become a reality. As drinking water standards continue to become more stringent, it will become more difficult to meet those standards. Also, while many of the members of SWA have obtained additional water from other sources thus far, this will not last forever. For this reason:

- A county wide rate study using cost of service methodology is recommended.

If the individual systems want to remain autonomous, a level of trust and cooperation must exist. At present, all entities are autonomous and control all business applications. At the same time, this autonomy comes with a price in that it is necessary to duplicate in each system many of the same things; i.e., billing, maintenance, legal fees, office space, etc. If members want to consider merging their systems or sharing in the cost of source and treatment, then:

- A "**cost of service study with a regional rate approach"** should be conducted by all members of SWA utilizing the same professional firm.

This will give SWA members consistent results, and will give all parties an idea on where to start.

Finally, while not part of the scope of work, when gathering data, it was discovered that many of the systems have considerable unmetered water. That is, water that is either produced or purchased yet never sold. This loss varied with the systems, but some have experienced losses over 30%. Typically, a system is considered very good if this loss is 10% or less. Anything over that number is wasted revenue, for that reason:

- It is recommended that each system make every effort to track down these losses. If each member will take time to compare water purchased/produced with what is sold, it can be seen that it is very expensive to ignore these losses.

2. Table of Contents

3. Purpose

Russom Technical Services, LLC (RTS) has been commissioned to study the possibility of the Saline Watershed Regional Water Distribution District, d.b.a. (doing business as) Saline Watershed Alliance (SWA) acquiring future water on a long term basis from, or in concert with, Central Arkansas Water (CAW). This is a result of information received from two previous studies:

1. Mid Arkansas Water Resource Study, prepared by the U.S. Army Corps of Engineer – November 2002, herein after referred to as the Corps study, and
2. Mid-Arkansas Water Resource Study Update, prepared by Garver Engineers – December 2004, herein after referred to as the Garver Study.

SWA was formed as a result of a request by Saline County Judge Lanny Fite to Chancellor Hathaway requesting that University of Arkansas at Little Rock (UALR) review Saline County's various water systems. The formation of SWA was a recommendation of UALR's report. For that they should be complimented.

The scope of work is outlined below:

1. Work with both entities to determine the feasibility of providing water to SWA on a long term basis. Options for either a raw water supply, treated water supply or some combination thereof will be explored.
2. Complete mapping of all facilities that comprise SWA and a quality inventory of existing lines, tanks, pumping stations and treatment facilities.
3. Review long range needs of each water purveyor in terms of providing water service for the next 20 to 30 years.
4. Make recommendations regarding partnerships or funding options for these long range needs.
5. Make recommendations regarding future water treatment facilities, transmission improvements and water sources for CAW and SWA.
6. Develop timetables along with preliminary costs for these improvements.
7. Present possible funding mechanisms between these two entities.
8. Develop timetables for implementing and funding proposed improvements.
9. Submit a report, along with maps, graphs and charts will be presented to this group. In addition, digital copies of SWA's existing facilities as well as proposed improvements will be provided in ESRI compatible GIS format to any member that wishes to have such.

This study was commissioned based on preliminary hydraulic studies completed by CAW engineering staff that looked at the possibility of providing water to SWA from the Winona pipeline that runs from Lake Winona to the Ozark Point Water Treatment Plant (Ozark) in Little Rock.

4a. Acknowledgements

It has been a pleasure to work with SWA and CAW in the preparation of this report. All parties have been exceptionally professional and it is the intent of RTS, LLC, to provide a report that it is both useful and applicable to both entities.

The assistance of Affiliated Engineers is also appreciated. They have provided considerable data and advice that has proved useful in the preparation of this report.

4b. Participating Entities

1. East End Water Improvement District #1 (East End)
2. City of Shannon Hills (Shannon Hills)
3. Sardis Water Association Public Water Authority (Sardis)
4. Saline County Water and Sanitary Sewer P.F.B. (Woodland Hills)
5. City of Bauxite (Bauxite)
6. City of Bryant (Bryant)
7. City of Benton (Benton)
8. Southwest Water Users Association (Southwest)
9. Paron-Owensville Water Authority (Paron)
10. City of Haskell Water System (Haskell)
11. Salem Water Users Public Water Authority (Salem)
12. Central Arkansas Water (CAW)

5. Discussion of Safe Yields

Below is an excerpt from the Corps report:

"Both groundwater and surface water are used as water supplies for this area and were considered for future water needs. Groundwater has served as a source of drinking water for many of the participating entities. Due to the safe yield concerns, concerns relating to poor water quality due to saline intrusions consistent with declining groundwater levels, and portions of the study area having been declared a "critical groundwater area" by the Arkansas Soil and Water Conservation Commission, alternatives utilizing groundwater sources will not be considered. ***All study participants who attended the June 27, 2002 meeting agreed to eliminate groundwater from further consideration as a future water source****" (emphasis added).*

The listing below reflects the existing sources and the safe yield (capacity) of each of those sources:

1 East End – 1.4 MGD firm from wells
2 Sardis – 3 MGD from CAW and 1.4 MGD firm from wells
3 Bauxite – 0
4 Shannon Hills - .75 MGD from CAW
5 Woodland Hills - .5 MGD from CAW
6 Bryant – 2 MGD from CAW
7 Benton – 10 MGD firm from Chenault reservoir for 90 days
8 Southwest – 0
9 Haskell – .35 from Benton Services Center (does not include contract with SWA)
10 Salem – 4 MGD from CAW
11 Paron - .25 MGD from N. Garland Co.

Total – 23.65 MGD

Safe yield is determined differently based on the source. If the source is a well(s), the safe yield is considered to be the amount of water that can be delivered on an average day without causing serious depletion. To be conservative, for an average day, it would be the sum of all of the wells based on the largest well being out of service. If there is only one well, the safe yield is considered to the average day amount that can be delivered from that well though it is wise to have plenty of storage in this situation, since a pump failure on that well would leave you with zero flow.

If the source is the Saline River, the safe yield is zero due to the fact that it can dry up in periods of drought. If the source is an impoundment, the safe yield is typically based on how many days of average demand during a drought can be sustained. This would not

hold true for a reservoir that has no watershed or any feed into the impoundment such as a stream or a river. That is to say Chenault reservoir can only be filled by pumping from the Saline River which has a safe yield of zero. The Saline River is augmented from Lake Norrell which has a safe yield of 6 MGD. At this time a pipeline from Lake Norrell cannot be constructed. If a pipeline is connected directly to Lake Norrell then the Arkansas Health Department would classify it as a municipal reservoir and as such a 300' buffer would be required around the entire lake. For these reasons the safe yield of the Saline river and Lake Norrell combined is 6 MGD.

For purposes of this report, a worst case scenario would be that some incident would occur on the Saline River between Benton and Lake Norrell (such as a chemical spill from a tanker truck) which would force the Benton water plant to rely solely on Chenault reservoir. If the reservoir is completely full, it has 950 million gallons. If this chemical spill were to occur in the summer when Benton was experiencing near maximum day demands, Chenault reservoir could yield 10 MGD consistently for 90 days. At that time, it would be depleted.

If the source is another supplier, i.e. treated water from another city, the safe yield must sustain maximum day demands. That is why CAW has written into most of their water contracts with wholesale customers that the maximum daily amount that can be utilized by a system is based on a 24 hour delivery day. This means that each entity must provide storage for daily peaking.

From the Safe Yield Study of Lakes Maumelle and Winona by FTN Associates, Ltd., November 4, 1999:

> *"Safe yield for Lakes Maumelle and Winona is defined as the minimum runoff on the watersheds that can be collected for use. Based on a period of 68 years of data, the safe yield of Lake Winona is 27 MGD and the safe yield for Lake Maumelle is 93 MGD*

This does not mean that more water cannot be taken from the lake(s). It just means that if there were a drought of record, the lake could deliver its safe yield for 365 days out of the year. In fact, more water can be taken from either lake. As an example, there are 6 pumps at Lake Maumelle with a firm capacity of 115 MGD (with the largest pump out of service).

The same is applicable at Lake Winona, the pipeline is presently "hydraulically" limited to 24 MGD which was considered to be the safe yield in 1936. It was not until 1999 when FTN Associates Ltd. restudied the lakes that the safe yield of Lake Winona was increased to 27 MGD. In fact as can be seen in this report, more can be taken from the lake. It is the responsibility of CAW to make certain that the combined safe yield of both lakes (120 MGD for 365 days as well as sufficient pumping at Lake Maumelle for maximum day demands) is not exceeded during the drought of record.

Finally from the Garver report- Section 7.1:

> *"Maumelle/Winona: The central area encompasses nineteen (19) members including: Central Arkansas Water, Bryant, Jacksonville, Bayou Two, Shannon Hills, North Pulaski, Sardis, Salem, Saline County PRB, Southwest, Cabot, Ward, Grand Prairie, Haskell, East End, Maumelle Water Management, Maumelle Water Corp, Lonoke, Benton. These members either have existing service from Maumelle and Winona, or with relatively minor pipeline extensions, could receive same.*
>
> *The total average day demand for these members is 102.63 MGD in the year 2050. The total available supply expected to remain in use for these members is 138.99 MGD. Supply exceeds 2050 demand by 36.36 MGD. The results of this compilation of data indicate that there are sufficient supplies available to meet MAWA members water needs throughout 2050".*

It should be noted that in Garver's report, the safe yield of both lakes was considered to be 116 MGD, not the 120 MGD from the FTN analysis. This probably was based on inaccurate information from CAW.

6. Population projections and methodology for determining future demands

Population projections utilized in this report as well as contained in previous studies have been provided by Metroplan. In addition, all participating entities have provided historical data which reflects the average day demand of previous years.

When estimating future water use projections, two methods are commonly utilized. One is to consider the existing population of an area, calculate the average gallons per capita per day (gpcd) and apply future population projections obtained from an entity such as Metroplan to estimate growth.

A second method is to plot the growth of a system/area based on historical data and make some projections of what will happen in the future. This would be applicable if there was information available that would not be reflected in Metroplan's growth numbers. An example of this unknown data is the project presently underway expanding the Salem water system by almost 1800 customers (known as the Lake Avila project).

Not all systems will grow at the same rate. Some like Salem and Paron are very rural and there is great potential to grow. Others, like Woodland Hills, are bounded on all sides and will not grow at the same rate.

In addition to growth due to population, there is a second event that must be considered, which is the average gpcd for a system as well as the maximum gpcd for a system. The total amount used in a year, divided by 365 days is referred to as an Average Day usage (AD). The greatest amount used in a 24 hour period is referred to as a Maximum Day usage (MD).

In performing a hydraulic analysis of an area for purposes of looking at sources, both the AD and MD demands should be analyzed. The relation between the two is called an AD to MD multiplier. This number is derived by dividing the MD by the AD - (MD/AD).

The table below is taken from the Garver report and reflects the MD/AD multiplier that was used by them as well as the average gpcd that was derived from data provided to them:

SYSTEM	AD	MD	MD/AD	AVERAGE gpcd
Central Arkansas Water	54.69	107.07	1.96	171.03
Benton*	4.1	6.48	1.58	145.27
Bryant	1.54	2.05	1.33	116.28
Haskell	0.3	0.4	1.32	100
Shannon Hills	0.17	0.26	1.52	100.44
East End	0.51	0.87	1.7	79.47
Paron	0.13	0.27	2.04	76.03
Salem	0.9	2.73	3.02	97.25

Woodland Hills	0.13	0.25	2	75.91
Sardis	1.34	2.35	1.75	93.13
Southwest	0.67	0.95	1.42	108.49

*Incls. Bauxite & Tull

Some things immediately become apparent, e.g., two similar systems, such as Paron and Salem, should have a similar multiplier. You can see that one is 2.04 and one is 3.02. This is not logical. Something is in error, though it is not certain just what it is.

Secondly, the higher the multiplier, the more affluent the area typically is. The larger number is a reflection of heavy watering which is usually caused by automatic sprinklers in the summer. Rural systems typically have lower multipliers than urban areas. It would stand to reason that the multiplier for CAW, Benton and Bryant should be the highest and the lower numbers should be the more rural areas. You do not see this in the previous chart but there are some reasons for this.

When talking with the individual systems, it was found that some of the systems have had a lot of leakage and some have had problems with the accuracy of the meter readings. It was reported that Paron, Woodland Hills and Benton had leakage that has been and is being repaired.

Below is a table that shows the 2005 population projections from Metroplan and the average daily usage provided by each of the systems. CAW is not included in this table since it was utilized to calculate the average gpcd for SWA systems. The gpcd was calculated by dividing the usage by the population:

SYSTEM	**POPULATION**	**GPCD**	**USAGE**
BENTON*	28229	145	4093205
BRYANT	13211	116	1532476
HASKELL	3023	100	302300
SHANNON HILLS	2546	65	165490
EAST END	6459	79	510261
SALEM	9285	97	900645
WOODLAND HILLS	1674	76	127224
SARDIS	13230	93	1230390
PARON	1735	76	131860
SOUTHWEST	6200	108	669600
TOTAL	85592		9663451
AVERAGE GPCD		**113**	

* includes Bauxite and Tull

Due to the apparent inconsistencies, for this report, an average gpcd of 113 was used and

multiplied by the Metroplan growth projections for each area. This yields an average day demand that is consistent for Saline County. This number is lower than that for CAW but based on the customer base, it should be. At the same time, it is not as low as some of the numbers above. It is believed that metering issues would account for some of the lower numbers above.

The next table shows population growth projections that are based on Metroplan projections for Saline county – (August 2004 METROTRENDS). The AD is calculated using the 113 gpcd derived above. The MD is based on a consistent multiplier of 1.7.

Again, this multiplier is lower than that used by CAW but is greater than any numbers that were utilized in the Garver report. This higher multiplier will yield higher demand projections.
This number is consistent with most hydraulic manuals and it is the same number that Affiliated Engineers has typically used for hydraulic analysis for each SWA member that utilizes them.

YEAR	POPULATION	%GROWTH	AD**	MD
2000	83529		9.36	15.9
2005	92670	10.94	10.38	17.64
2010	101971	10.04	11.42	19.42
2015	111555	9.4	12.49	21.24
2020	121970	9.34	12.49	21.24
2025	133191	9.2	14.92	25.36
2030	144660	8.61	16.2	27.54

** - calculated using population times the average gpcd of all systems (113)

It should be noted that these numbers reflect an annual growth of about 2%. This is mentioned because many members of SWA have related that they believe the growth rate of their systems should be about 5% per year. Metroplan has not reflected this in their numbers. However, it should be noted that Benton's growth rate during the past year was 6%. In addition, the growth rate for Saline County for the last 10 years has been just less than 3% per year. If a 3% growth was sustained until 2030, the population would be 194,000 yielding an average day demand of 22 MGD and a maximum day demand of 37 MGD.

It is for this reason that multiple methods were used for calculating growth.

7. Description of each member of SWA

In order to understand the following graphs, some explanation would be helpful. Typically, each graph is based on the historical data that was provided. The historical average day (AD)-shown in blue, is then multiplied by the MD/AD multiplier discussed in Section 6 to yield the MD curve – shown in yellow. From that, two different growth curves are typically shown. One is a linear growth curve. It takes the historical data and then projects a straight line through the best fit of the existing data. The second curve that tends to curve up is known as an exponential curve. This curve assumes some cumulative growth, i.e. 3% per year, from the present forward. It is not unrealistic to believe that a systems actual growth should fit between these two growth curves.

Another piece of data shown on these graphs is the projected growth curve from the Garver report (noted as M-AWRSU). These growth projections were typically based on Metroplan's population projections but they used the average gpcd shown in the chart in Section 6. To repeat, it is not the opinion within this report that these numbers accurately reflect the system. The reasons for this statement are addressed in the previous section (i.e. leakage).

Finally, the safe yield of a system (when there is one) has been projected on each graph. The time when additional water will be needed is based on the intersection of the growth curves with that safe yield.

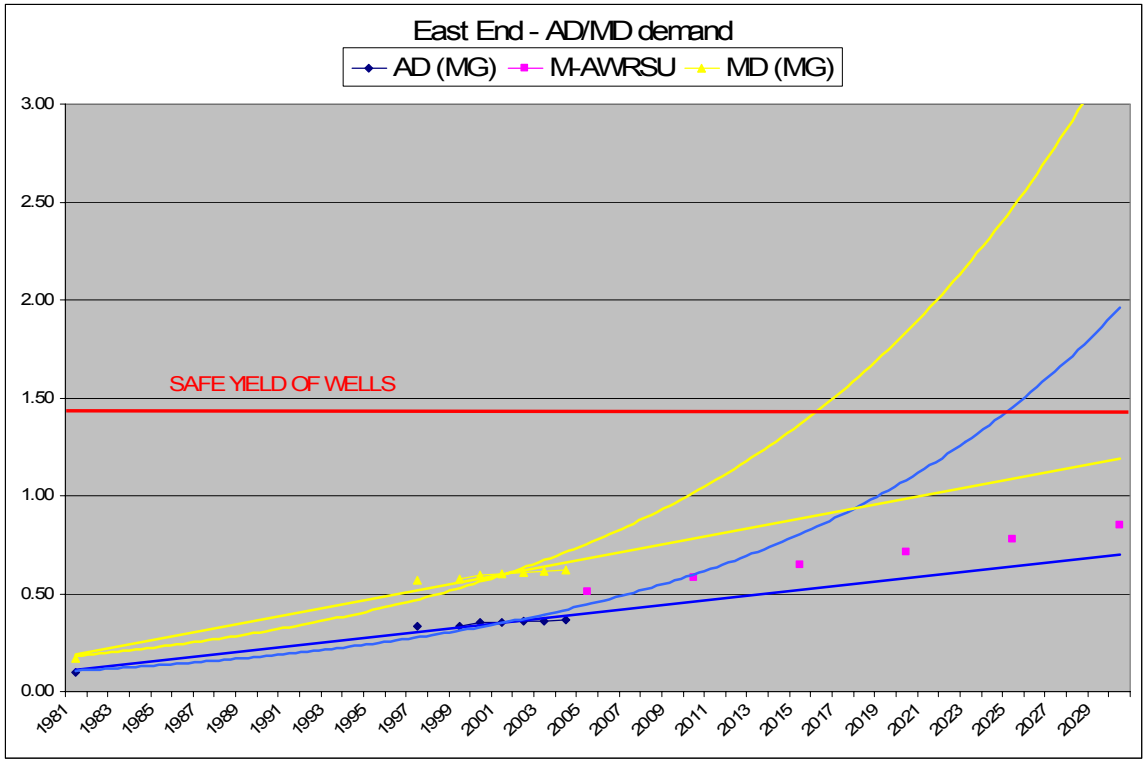
East End Water Improvement District #1

East End relies solely on wells as its source of water supply. At present, they have 4 wells:

Well #1 – 530 GPM
Well # 2 – 150 GPM (considered as an emergency supply)
Well #3 – 400 GPM
Well #4 – 860 GPM

The safe yield on an average day from these wells would be considered to be the sum of all flows with the largest well being out of service. In other words, the safe yield is 1080 GPM (1.6 MGD).

Since this is the maximum amount that can be withdrawn from the ground in a 24 hour period and since there is no raw water storage, this 1.6 MGD would be considered adequate until the maximum day usage for East End reaches this amount. Based on the graph below, this could occur as early as 2016 or as late as 2030, depending on which growth curve is used. It should be noted that both growth projections exceed that shown in Garver's report.



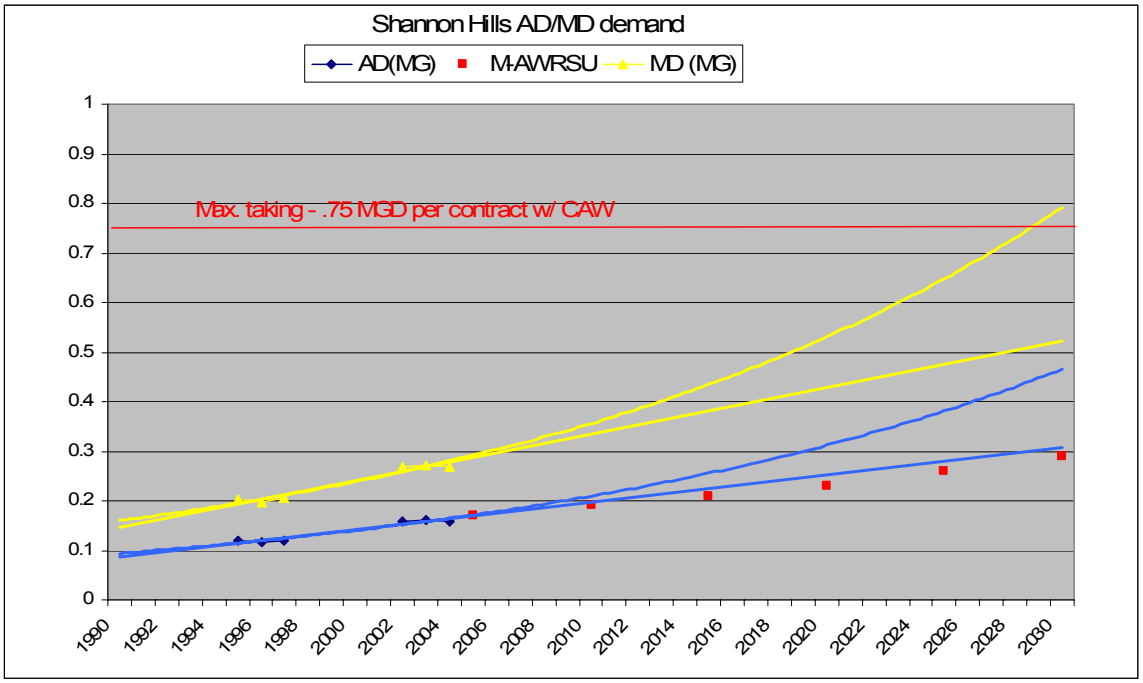
Since East End has 4 wells and since it appears feasible to drill additional wells, they could stay on ground water for the foreseeable future.

However, for redundancy, it is recommended that East End get a back-up connection to either CAW or Sardis At the very least, they should make certain that they have a back-up well for maximum day usage at all times.

Shannon Hills

The city of Shannon Hills relies solely on Central Arkansas Water for its water supply. At this time they have two meters located on the county line. In accordance with their contract, they may purchase up to .75 MG per day through these two meters. Since this is the maximum amount that can be withdrawn on a daily basis, the maximum daily usage of the city would govern when additional water is needed.

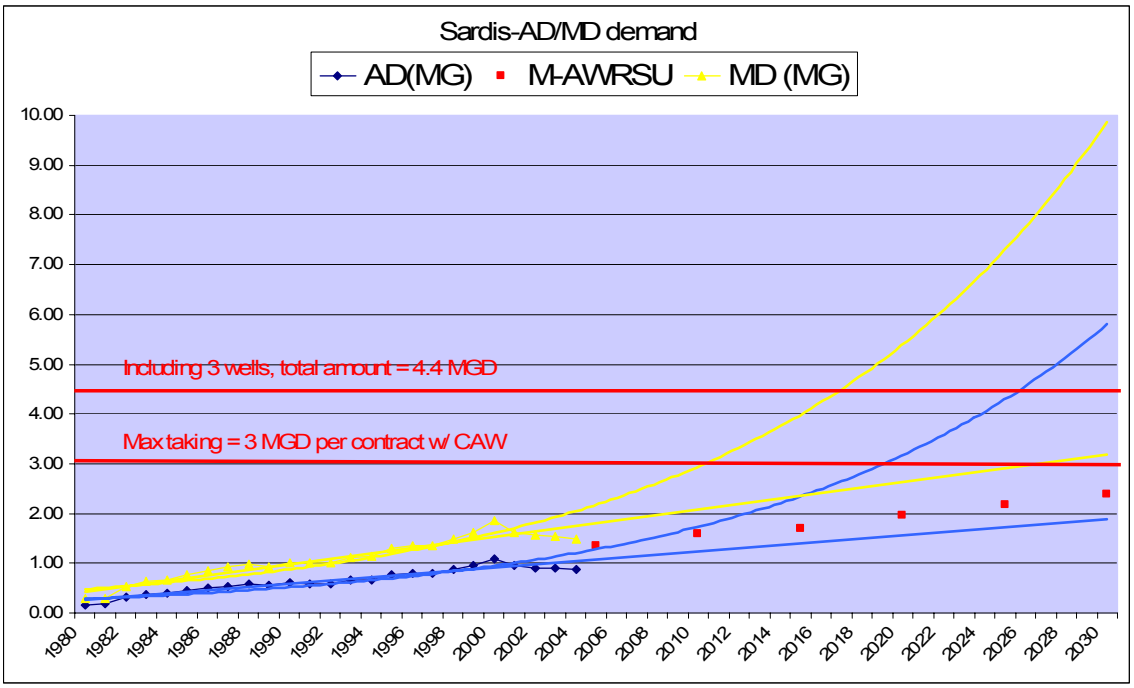
Based on the graph below, their water supply is adequate until at least 2029. For this reason, it does not appear that they will need an additional source.



It should be noted that both meters take water out of the Mabelvale pressure system of CAW. If there is a problem with that system, they would be out of water when their tanks are depleted. For this reason, they should consider an alternate emergency supply, possibly from Sardis or Bryant.

Sardis Water Association

Until this year, Sardis relied solely on groundwater. The safe yield of the wells with one well out of service is 1.4 MGD. Through a contract with CAW, they are allowed to purchase 3 MGD of water per day. This is a maximum flow rate; therefore, the amount of water that is presently available for a maximum day demand is 4.4 MGD. Based on the graph below, they could need additional water as early as 2017.



Since Sardis, Shannon Hills, Woodland Hills and Bryant are all served off CAW's Mabelvale Pressure system, for redundancy, it appears that Sardis water would benefit by an additional connection to another water supply, such as East End or Bauxite.

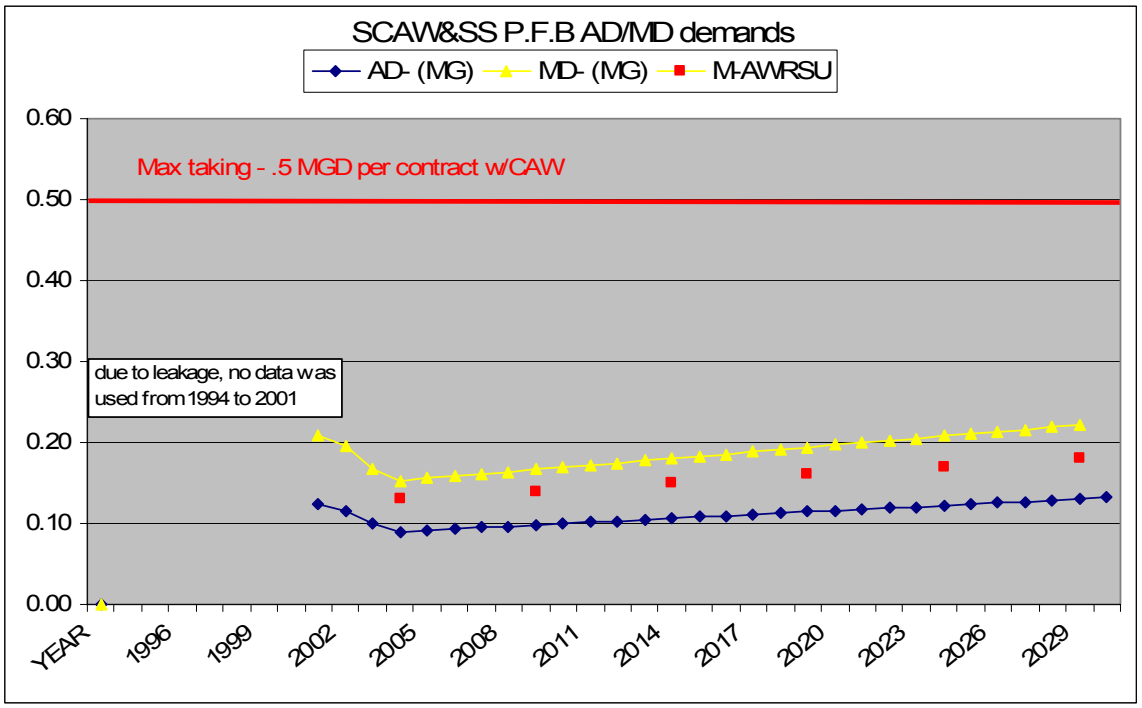
For justification of this recommendation, you have only to go next door to Woodland Hills. They recently established a connection to Bryant, but did not withdraw water this year in order to assist them during their maximum day problem that they experienced this year. If CAW were to have a major issue with their Mabelvale pump station, it would be detrimental to all systems connected to it.

Between the two existing sources, Sardis is in fair shape. If no water was available from CAW, they could handle their average day demand from wells until 2008 or 2010 (but not maximum day). With CAW water and no wells, they would be able to handle the average day demand until 2020 or 2030, but could only handle maximum day demand until at least 2011.

Saline County Water and Sewer PFB (Woodland Hills)

Woodland Hills is surrounded by Sardis, Shannon Hills, Alexander and Bryant. They currently take the bulk of their water from wells. They have constructed a new transmission main to Bryant but have been unable to use this new supply until Bryant makes improvements necessary to gain additional water from CAW or some other supplier. A small segment of the Woodland Hills system, St. Joseph's Glen subdivision, is served through a master meter connected to CAW. They presently purchase water from CAW and also have wells which will be phased out of service.

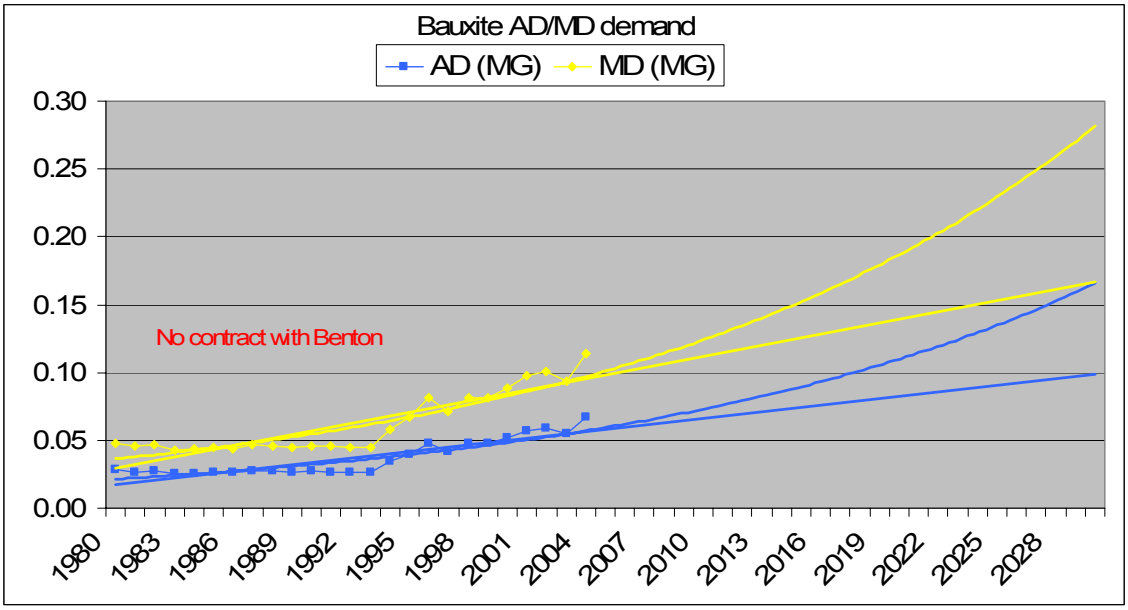
The possibility for rapid growth is slim. Based on the graph below Woodland Hills has adequate water until well past 2030 just from CAW alone.



Bauxite

At present, Bauxite purchases all of its water from the City of Benton. They have two metering stations having recently installed an additional feeder line and meter. The meters are adequate to provide both domestic and fire flow. From information provided thus far, there does not appear to be a water contract between Benton and Bauxite.

Based on the graph below, they should not need more that .25 MGD until 2030. This equates to a flow of 173 GPM on a continuous basis. Their present connection to Benton will handle this amount easily.

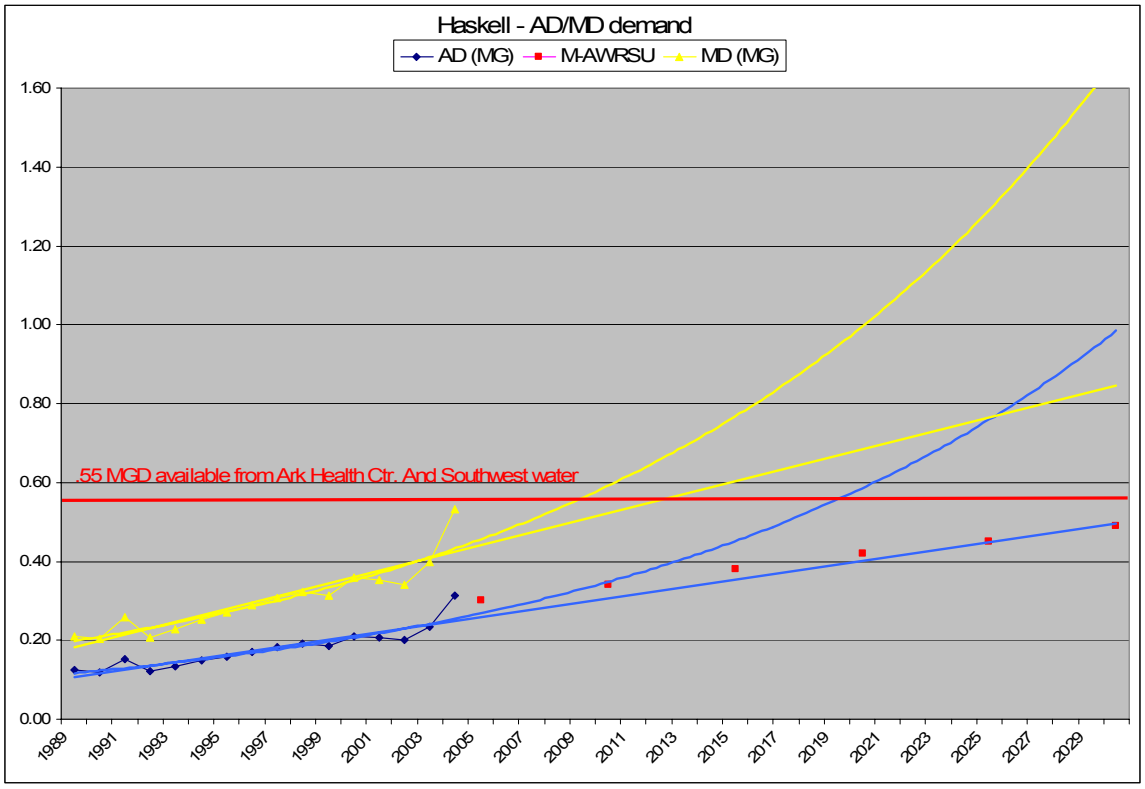


While the supply from Benton is adequate, it appears that Bauxite does not have a contract with Benton and has few choices for water. They can purchase it from Benton, Sardis or Tull when Tull obtains their water supply. Bauxite needs to consider entering into a contract for long term supply(s) at a reasonable rate.

Also, for redundancy of water supply to water systems in Eastern Saline County, Bauxite would provide a good connection of well water in the East to surface water in Western Saline County.

Haskell

The city of Haskell obtains it water from both the Arkansas Health Center (350,000 per day contract) and Southwest water (200,000 per day contract), which is purchased by Southwest from the city of Benton. Reviewing their growth in the last few years, they could need almost 1.7 MGD by the year 2030.



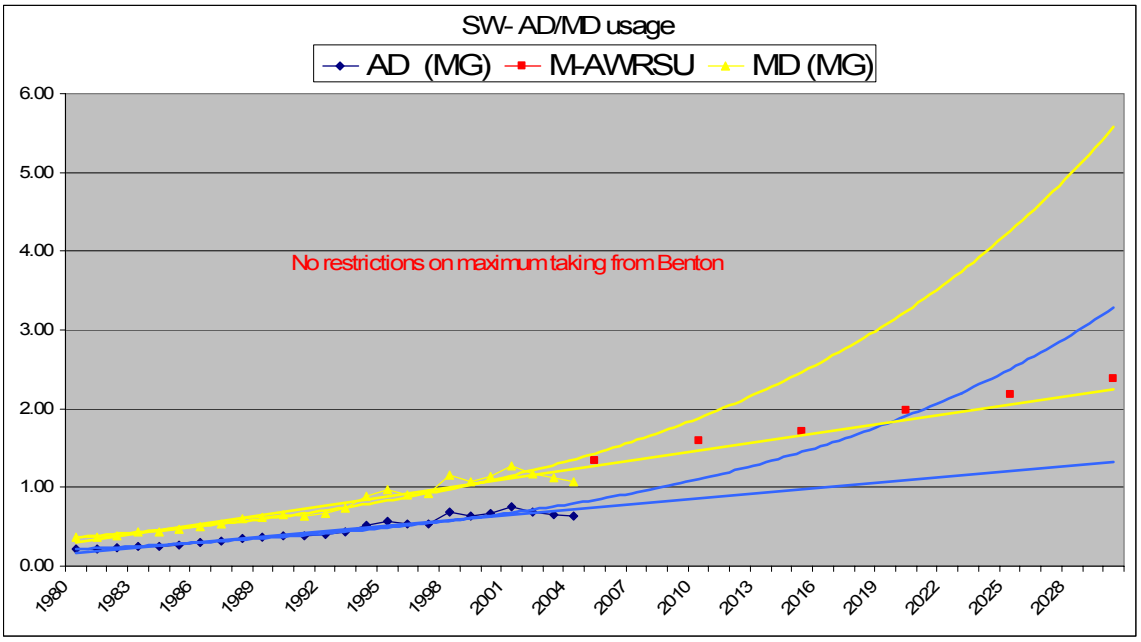
Also, you can see that they could easily exceed their contract amount by 2009 to 2011. For this reason, they should obtain additional water as quickly as possible.

Southwest Water Users Association

As noted in the last study by Garver Engineers:

"the Southwest Association expects to remain a partner with the City of Benton indefinitely".

As can be seen by the graph below Southwest could expect a maximum day demand of as little as 2.2 MGD or as much as 5.5 MGD by the year of 2030. A forecast of 3.5 MGD by 2030 seems reasonable for this report.



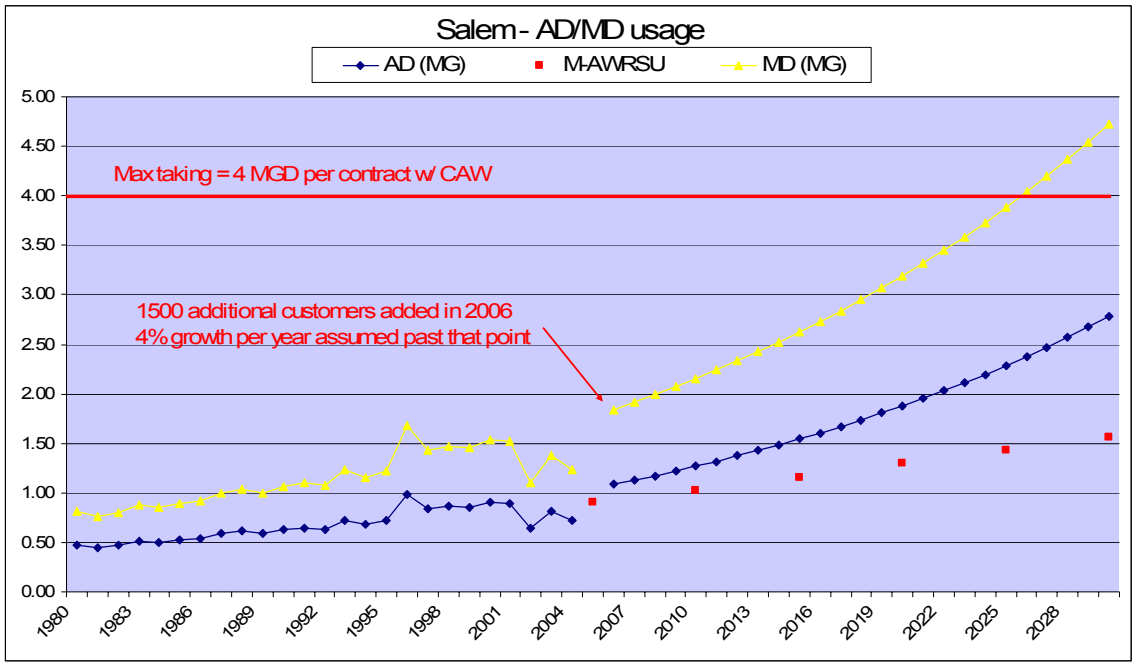
With the city of Benton as a sole source, Southwest should have a concern that Benton consider their future needs when securing an additional water source. A serious contractual partnership with Benton is required if they are to continue receiving water when needed.

Salem Water Users

At present, Salem obtains all of its water from the city of Benton. In the Garver Engineers report that was published in December 2004, the comment was made that they:

"intend to do so indefinitely."

However, on the 21st day of October 2004, Salem Water Users signed a contract with CAW to obtain up to 4 MGD in a 24 hour period. As can be seen in the graph below if all the water was purchased from CAW solely, Salem should have adequate water until 2028. Given the fact that they have a contract with Benton that has no restrictions on maximum taking, they are in a very good position at this time.

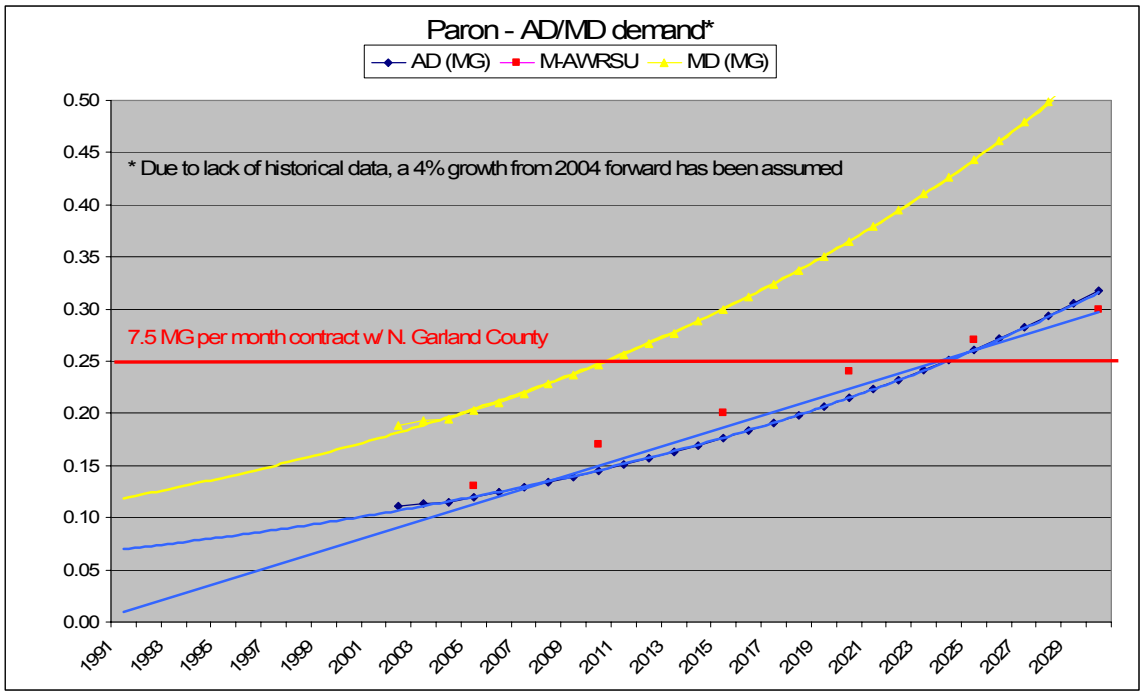


Since Salem has secured water from Benton and CAW to insure an adequate supply until 2028, even without Benton, it seems reasonable that Salem could sell water to either Paron, Bryant, or even both.

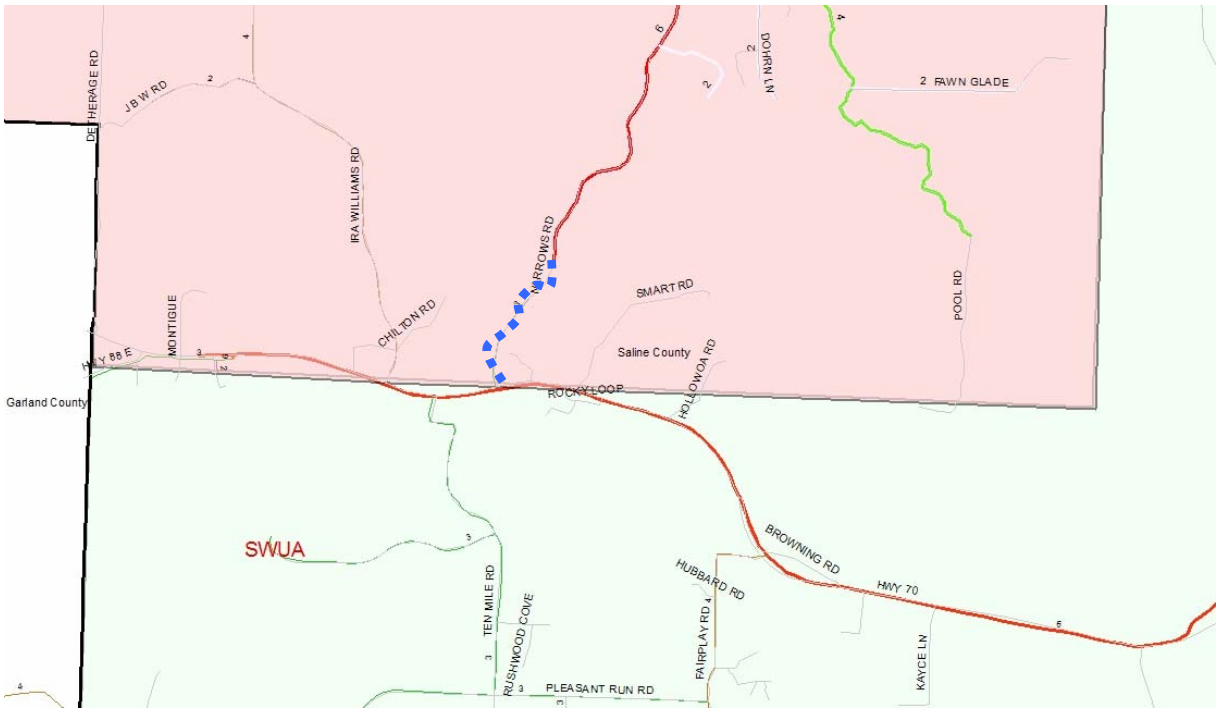
Paron-Owensville Water Authority

Paron purchases all of its water from the North Garland County Water Users Association. Per contract, they are allowed to take 7.5 MG in a one month period. This would mean that during a summer similar to the ones just experienced in 2000 and 2005, the amount withdrawn for a maximum day demand would be .25 MGD.

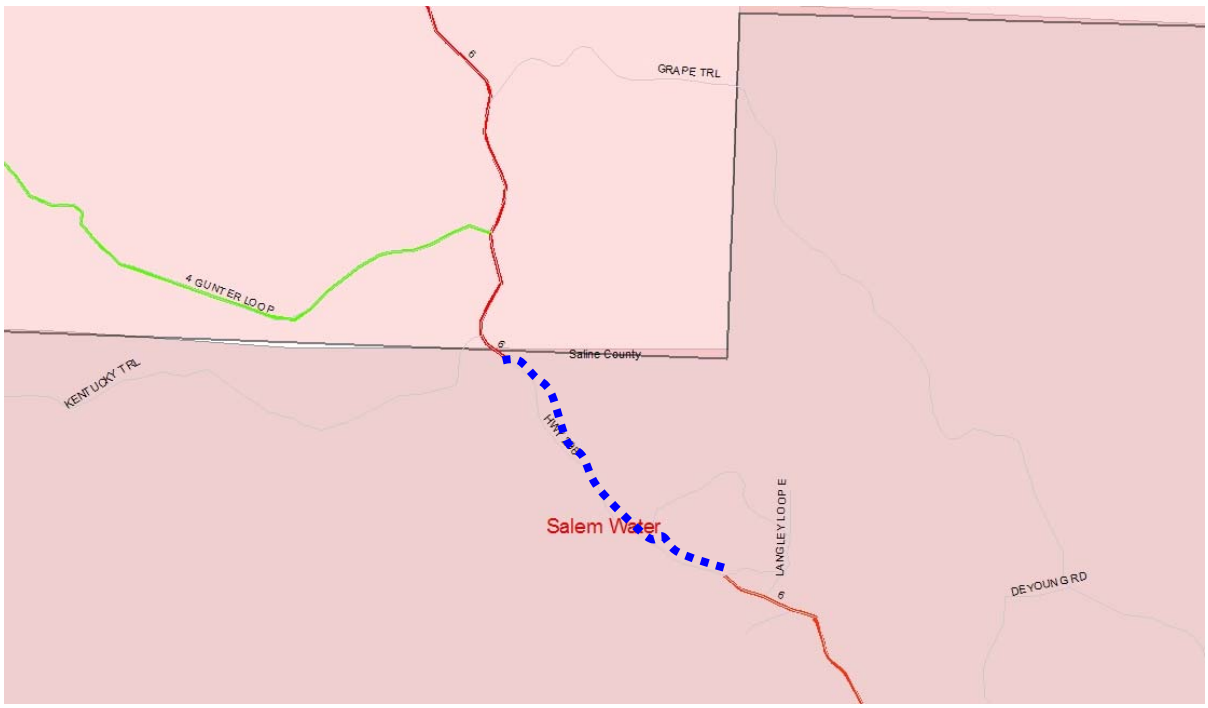
As can be seen, due to the lack of historical data, a growth rate of 4% per year has been assumed. This means the contract amount with North Garland County could be exceeded in a hot summer month as early as 2011.



For this reason, it is necessary for Paron to proceed very soon in acquiring an additional source. They have been talking to CAW about purchasing raw water, but due to their proximity to Southwest and Salem, it would seem wise to enter negotiations with one or both of these entities. As can be seen on the next page, it appears that they have water lines within 2800 feet of Southwest lines at Hwy. 70 and Narrows Rd.



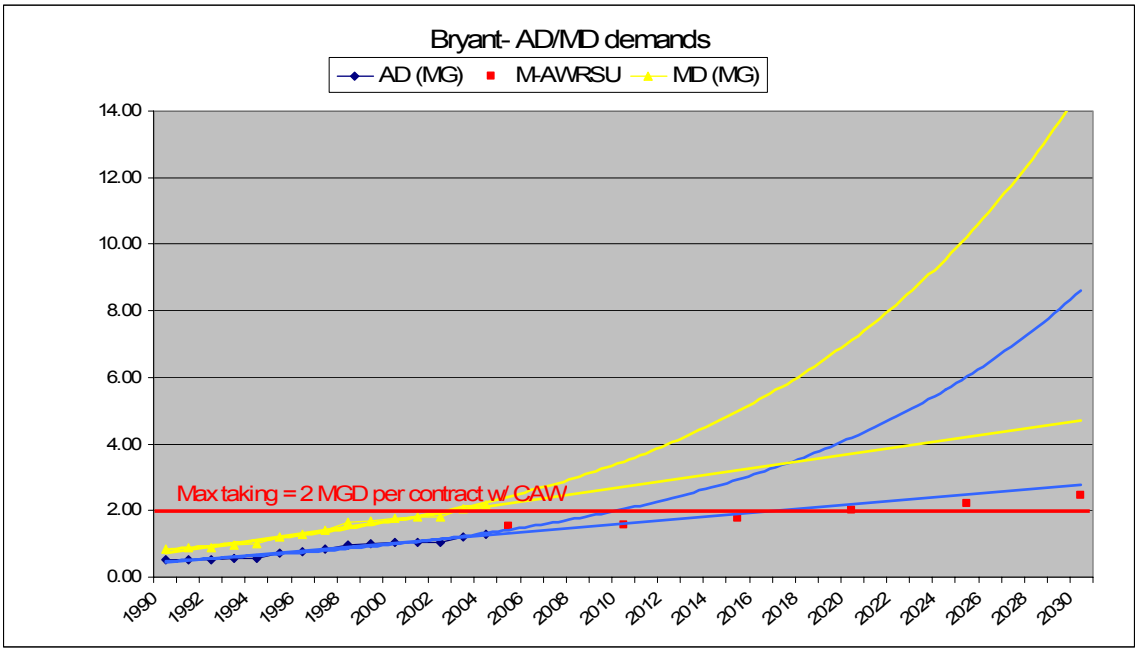
In addition, as shown below, there seems to be a potential connection point between Paron and Salem along Hwy 298. The distance between the two lines is about 4000 feet.



If negotiations between one or both could yield a price that is reasonable, purchasing water is recommended over operating a small package water plant off the Winona pipeline. While the water quality of the raw water is excellent, it could not be depended on as a sole source. From time to time, CAW has to take this line down for maintenance. In addition, at some future point, the intake will require maintenance, since it is 70 years old.

Bryant

The city of Bryant was one of the first to secure water from CAW. The original contract was signed in 1988 and allowed for up to 2 MGD in a 24 hour period. At that time, their maximum day demand was less than .8 MGD. In 2004, their maximum day exceeded the 2 MGD contract amount.

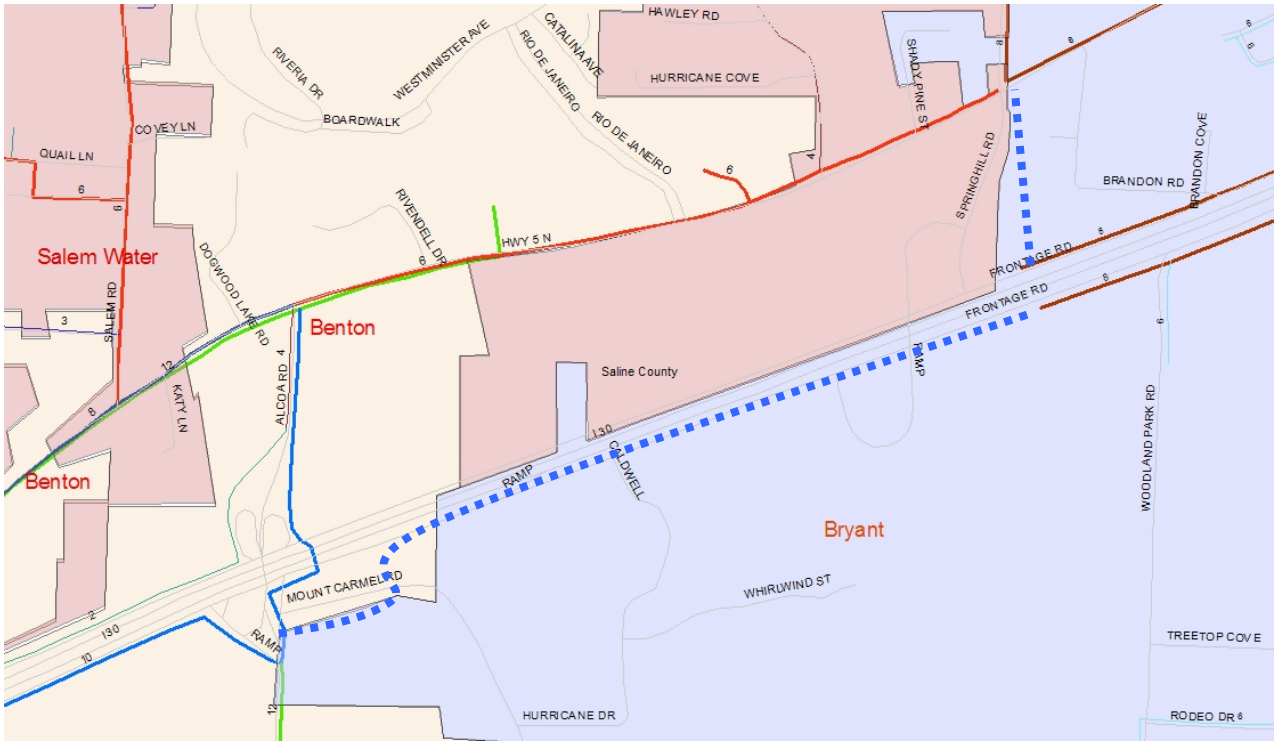


In September 2002, they requested an additional 1.1 MGD from CAW. According to CAW, they have communicated that they can provide Bryant with an additional 1.1 MGD at the location of I-30 and County line. This 1.1 MGD would only provide water until 2008 to 2010 and would require additional infrastructure within CAW's system. In March 2005, Bryant requested a total of 4 MGD from CAW.

The city of Bryant needs additional water immediately. They appear to have three options at this time:

1. Complete negotiations with CAW to obtain 1.1 MGD or more in additional water,
2. Enter into negotiations with Benton for additional water,
3. Enter into negotiations with Salem for additional water.

It appears that water could be obtained from Benton in the area of I-30 and Mt. Carmel or from Salem at Hwy 5 and Springhill as shown below:



Something that possibly could be blocking the second and third option is the price that Bryant would have to pay as compared to purchasing additional water from CAW. What must be considered is that an additional 1.1 MGD will only last Bryant for about 3 or 4 years, and the price for additional water past that point is yet to be determined.

It is critical that Bryant secure additional water now that will last them for this study period.

Benton

In accordance with an engineering report on water System Improvements, January, 2002 – Affiliated Engineers:

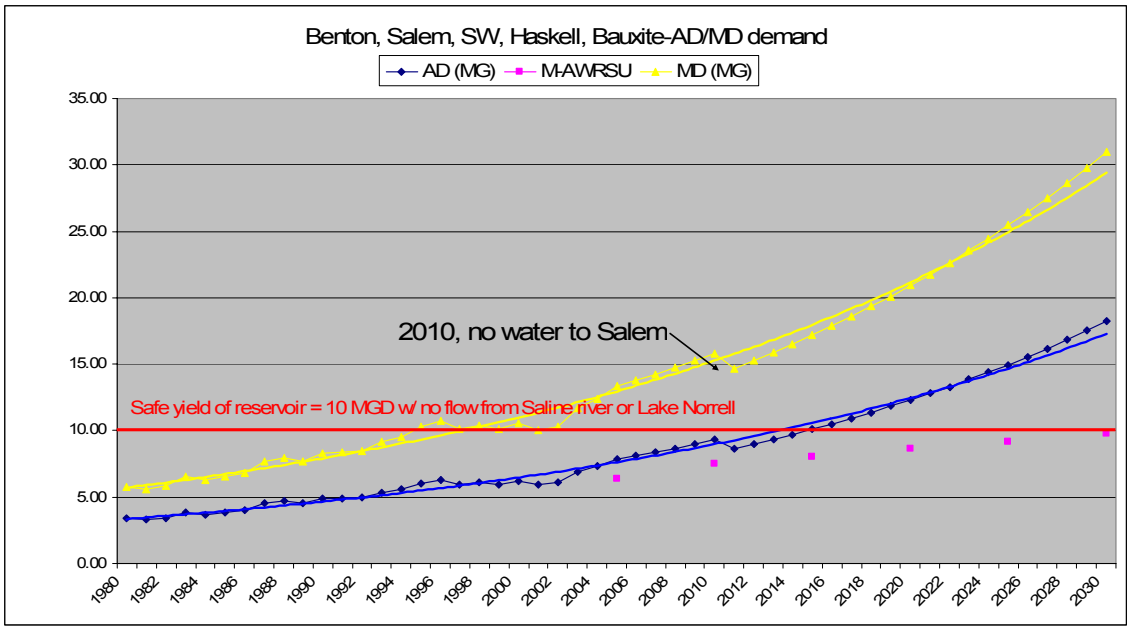
1. *"The firm water supply yield of the Saline River is zero flow."*
2. *"The firm yield of the Saline river including flow augmentation from Lake Norrell is six (6) million gallons per day (MGD)"*
3. *"The off-stream reservoir provides adequate raw water storage capacity to augment or completely replace river flow for an extended period to withstand a drought condition or to avoid the use of contaminated river water from a chemical spill or other catastrophic event. The reservoir capacity is approximately 950 million gallons. This storage capacity increases firm yield of the raw water supply to a minimum of approximately 12 MGD for a period of 120 days."*

950 million gallons for 90 days would provide a flow of 10 MGD. If there was a chemical spill between Lake Norrell and the Benton water treatment plant, the safe yield from the Saline River and Lake Norrell would be zero. Therefore the conservative safe yield of all three sources would be 10 MGD.

Benton serves Southwest, Bauxite, Haskell, Tull and Salem. Tull is seeking a new source and Salem has acquired water from CAW. In accordance with an e-mail from Mike Bolin of Affiliated Engineers:

> *"We would expect that Salem will continue to purchase water from Benton at the average rate of approximately 1 MGD for at least the next five years and possibly longer."*

The graph below reflects a safe yield of 10 MGD for 90 days from Chenault reservoir and Salem acquiring water from Benton at the rate of 1MGD for the next five years.



Based on the growth curve above, it is expected that the safe yield will exceed the average day demand by 2019. If there was a chemical spill in the middle of the summer with maximum day demands that extend for the full 90 days, then the reservoir yield could be exceeded as early as 2006. While this scenario is remote, it is worth noting.

It should also be noted that the safe yield of 10 MGD is based on the reservoir being completely full, not at ¾ capacity as it is being operated currently.

Finally, the plant capacity should be equal to or exceed the maximum day demand. As you can see, the plant needs upgrading right now. From discussions with Affiliated Engineers and the Arkansas Health Department, it might be possible to upgrade the plant to 18 MGD by constructing a new sedimentation basin and re-rating the filters from 2 gpm/sf to 3 gpm/sf. This will require a test. It is understood that this testing in already in the planning stage between Affiliated and Benton water officials.

The city of Benton is wise to be looking at additional sources at this time. If water is not obtained from Lake Winona, between engineering and construction, it could easily take 10 years to get another source on-line.

8. Description of Alternatives

In order to understand the graphs below, some explanation is needed. HGL stands for hydraulic grade line. Water pressure is a function of the HGL and elevation. If you measure the difference between the two and multiply by .43 you will obtain the pounds per square inch (psi) that is in the water line. As an example, the difference between the HGL and elevation at the intake is about 50 feet. In other words, the pipe that exits the intake is 50 feet below the lake level. This equates to about 22 psi of water pressure

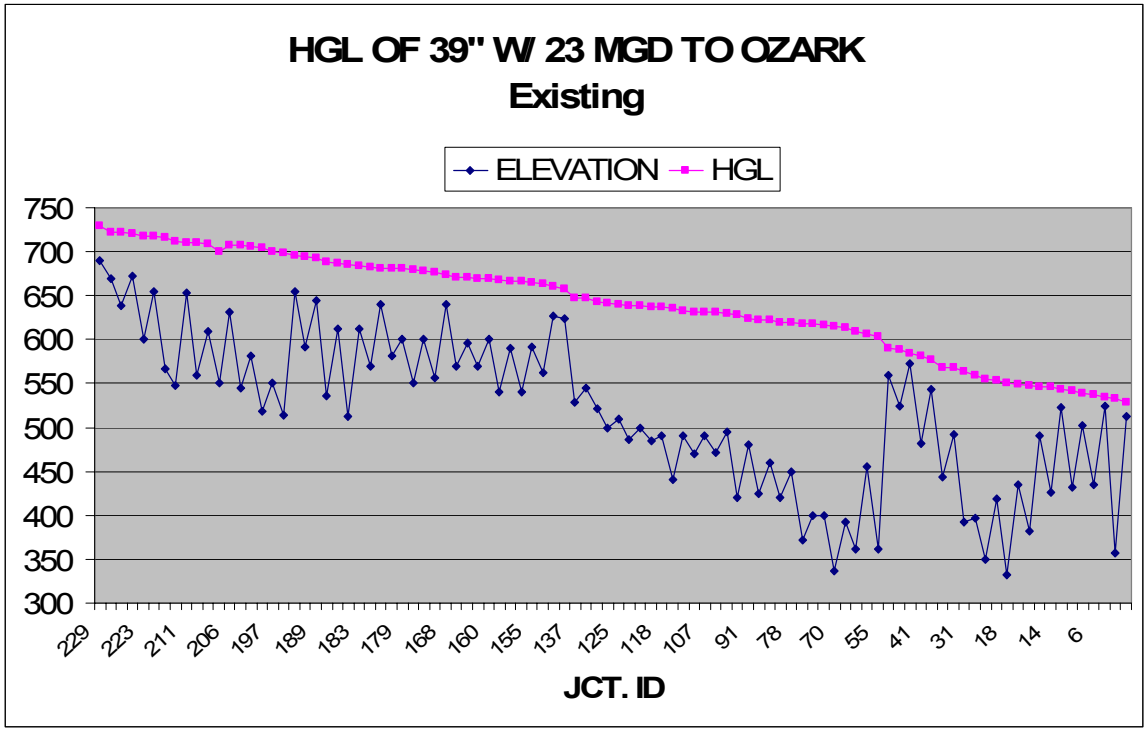
As water flows through a pipeline the friction that exists between the water and the pipe wall creates pressure loss, hence the HGL decreases as you move down the line. You must maintain positive pressure so the HGL plotted against the elevation must always be above the elevation line. When you look at all of these graphs, the hydraulic model was adjusted for flow in order to keep this HGL positive. That is why as you move the connection point further down the Winona pipeline towards Little Rock, the higher velocity that is created by the higher flows, increases the pressure loss. In order to correct this situation, and at the same time keep the flow rate constant into the Benton Water Treatment Plant, the flow that continues into the Ozark Point Water Treatment Plant has to be decreased in order to maintain this positive relationship between HGL and elevation.

a. Winona pipeline as it presently exists

As stated previously, the Winona pipeline was constructed and paid for by the City of Little Rock in 1936 at the same time that the lake was created. It has delivered 24 to 22 MGD to CAW on almost a daily basis since the 1960's. The safe yield of Lake Winona is about 27 MGD. That does not mean that more water cannot be taken from Winona, it just means that if there were a 1 in 100 year drought, the lake could deliver 27 MGD for the entire year and should still be in a condition that it could be replenished.

More water could be taken from the lake, but withdrawal rates are limited by the capacity of the transmission line to the Ozark Point Plant.

Below is a graph that shows the hydraulic grade line of the pipe as it is delivering 23 MGD to the Ozark Treatment Plant:



The blue line on the graph shows the ground profile (Elevation) and the pink line shows the hydraulic grade line (HGL) of the water as it flows through the pipe. It can be seen that there are points on the graph where the HGL comes very close to the ground. As an example, at point 40, they are very close. When performing hydraulics on this pipeline, the HGL must stay above the elevation.

This graph is used as a point of reference when discussing the Alternatives.

b. Raw water Alternatives

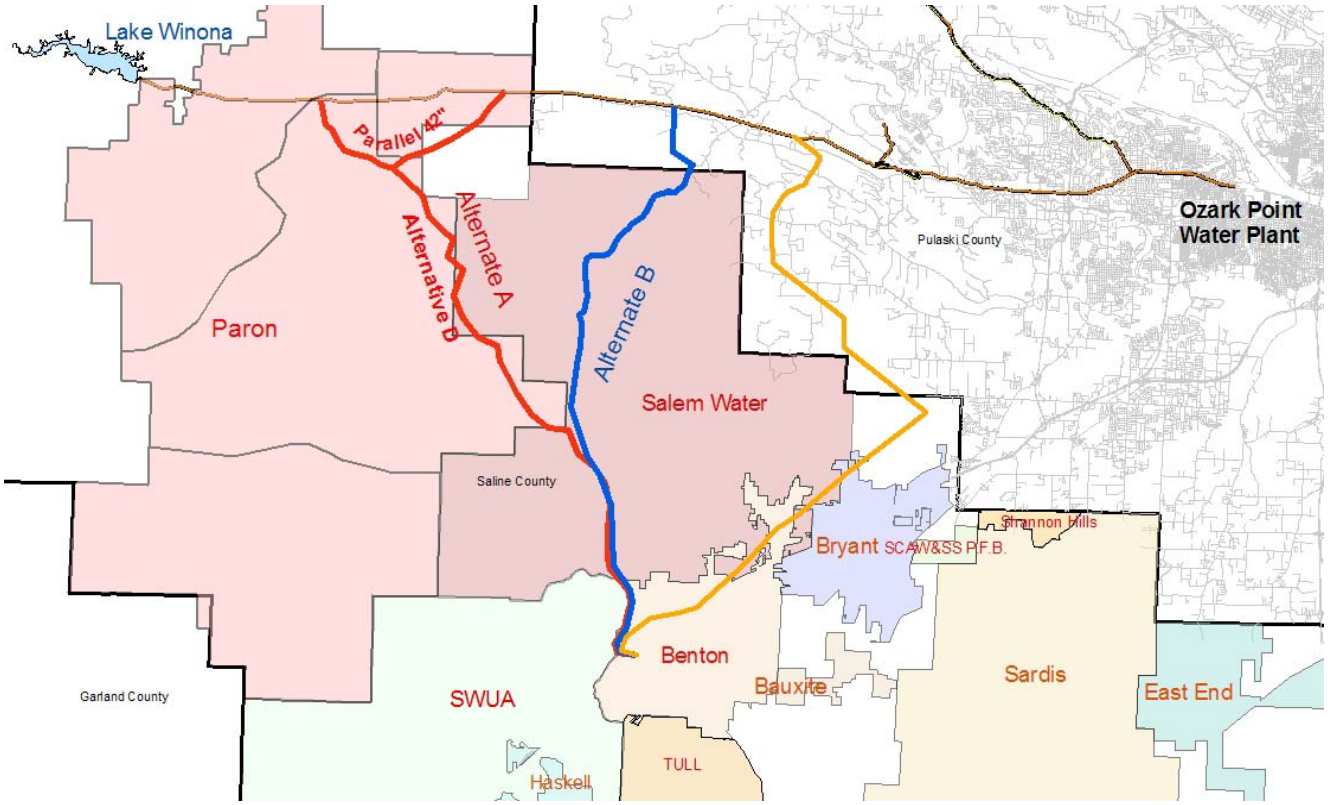
The drawing below shows four possible scenarios to bring raw water off the Winona pipeline to the Benton Water Plant.

Alternative A shows a connection to the Winona pipeline at the approximate location of Hwy 9 and the community of Paron.

Alternative B shows a connection to the Winona pipeline near Ferndale road.

Alternative C shows a connection to the Winona pipeline near Kanis and Denny road.

Alternative D follows the same route as Alternative A except the parallel 42" is not needed and the flow is less.



Under three of the four alternatives above, the intent was to take 12 MGD from the Winona pipeline. Alternatives A, B and C will deliver 12 MGD to the Benton Water Plant. From there, it could either be treated directly or diverted to the Chenault reservoir for storage. Each of these three alternatives includes a 12 MGD treatment plant expansion.

Alternative A

The first thing that became apparent when running the hydraulics was a hill just past the proposed connection point that would not allow additional water over 23 MGD to continue on to the Ozark plant. For this reason, it can be seen that there is a parallel section of line that will need to be installed around this hill. This was not an issue in 1936 when the pipe was built because it was designed to deliver no more than 24 MGD.

It should be noted that this section of parallel line is necessary in all three 12 MGD alternatives. With this section of parallel 42-inch line and a 30-inch line that traverses south along the Saline River, it is possible to bring 12 MGD to the Benton plant and still deliver 22 MGD to the Ozark Treatment Plant.

The estimate for such is shown below:

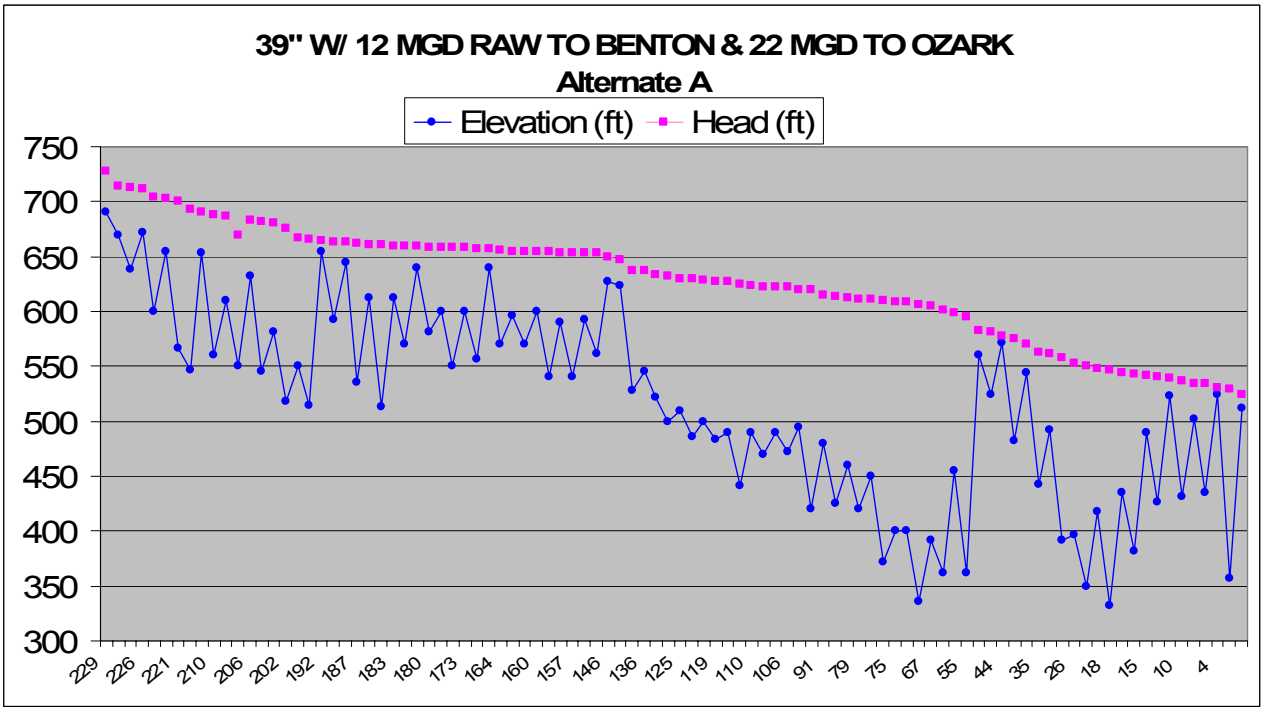
DESCRIPTION	SIZE	QUANTITY	UNIT	COST/UNIT	TOTAL
Parallel line on 39" @ Paron	42	32200	L.F.	$135.00	$4,347,000
Raw water line from Paron to Benton Plant	30	89500	L.F.	$100.00	$8,950,000
TOTAL EST. CONST. COST					$13,297,000
ENGINEERING		11	%		$1,462,670
R/W for pipeline		84	Ac.	$5,000.00	$420,000
CONTINGENCIES		10	%		$1,517,967
ADMIN. & LEGAL		1	%		$166,976
TOTAL ESTIMATED PIPELINE COST					$16,864,613

DESCRIPTION	QUANTITY	UNIT	COST/UNIT	TOTAL
12 MGD UPGRADE TO BENTON PLANT * - **	12 MGD			$9,000,000
ENGINEERING	11	%		$990,000
LAND ACQUISITION	40	Ac.	$15,000	$600,000
CONTINGENCIES	10	%		$1,059,000
ADMIN. & LEGAL	1%	%		$116,490
TOTAL				$11,765,490

* - first 6 MGD upgrade is based on rerating existing filters from 2gpm/sq. ft. to 3 gpm/sq. ft.

** - Next 6 MGD upgrade requires filters, basins, and clearwell

The graph below reflects the HGL from Winona to Ozark with a 12 MGD flow to the Benton Plant.



Alternative B

It was originally thought that it might be possible to make a connection closer to the Pulaski-Saline county line. The reason this was considered was to see if raw water could be delivered initially, with the possibility of building a treatment plant later. The problem that occurs in this alternative as well as Alternate C is that as the connection point is moved further east, the flow that can be delivered to the Ozark Treatment Plant diminishes. In addition, the amount of pipeline that needs to be constructed increases. The cost for Alternative B is as follows:

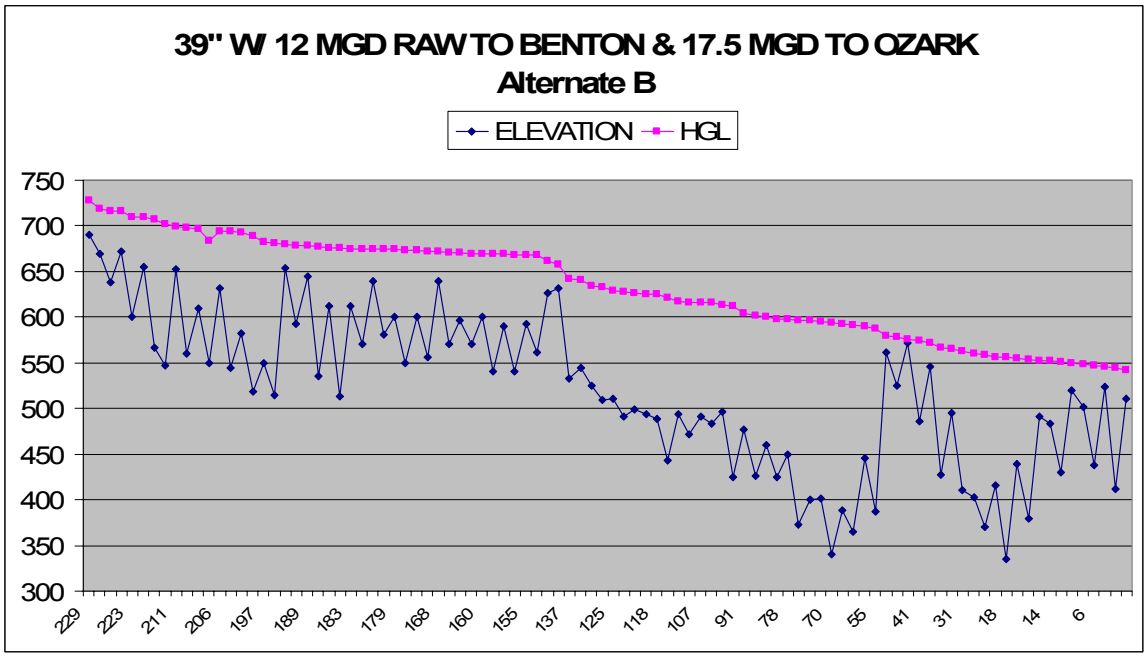
DESCRIPTION	SIZE	QUANTITY	UNIT	COST/UNIT	TOTAL
Parallel line on 39" @ Paron	42	32200	L.F.	$135.00	$4,347,000
Raw water line from Ferncliff to Benton plant	30	94250	L.F.	$100.00	$9,425,000
TOTAL EST. CONST. COST					$13,772,000
ENGINEERING		11	%		$1,514,920
R/W for pipeline		87	Ac.	$5,000.00	$435,000
CONTINGENCIES		10	%		$1,572,192
ADMIN. & LEGAL		1	%		$172,941
TOTAL ESTIMATED PIPELINE COST					$17,467,053

DESCRIPTION	QUANTITY	UNIT	COST/UNIT	TOTAL
12 MGD UPGRADE TO BENTON PLANT * - **	12 MGD			$9,000,000
ENGINEERING	11	%		$990,000
LAND ACQUISITION	40	Ac.	$15,000	$600,000
CONTINGENCIES	10	%		$1,059,000
ADMIN. & LEGAL	1%	%		$116,490
TOTAL				$11,765,490

* - first 6 MGD upgrade is based on rerating existing filters from 2gpm/sq. ft. to 3 gpm/sq. ft.

** - Next 6 MGD upgrade requires filters, basins, and clearwell

While the cost is still very close to Alternative A, the amount of water that can be delivered to Ozark is only 17.5 MGD The graph below reflects such. By comparing this graph with the first Alternative, it can be seen how the HGL changes.



Alternative C

It appeared to be possible to move the connection point even further east thereby providing raw water to the plant and, at the same time, construction of a line that would pass through CAW's system as well as Bryant's system. Due to the hills between the Winona pipeline and Bryant, the distance became too great. The cost for Alternative C is:

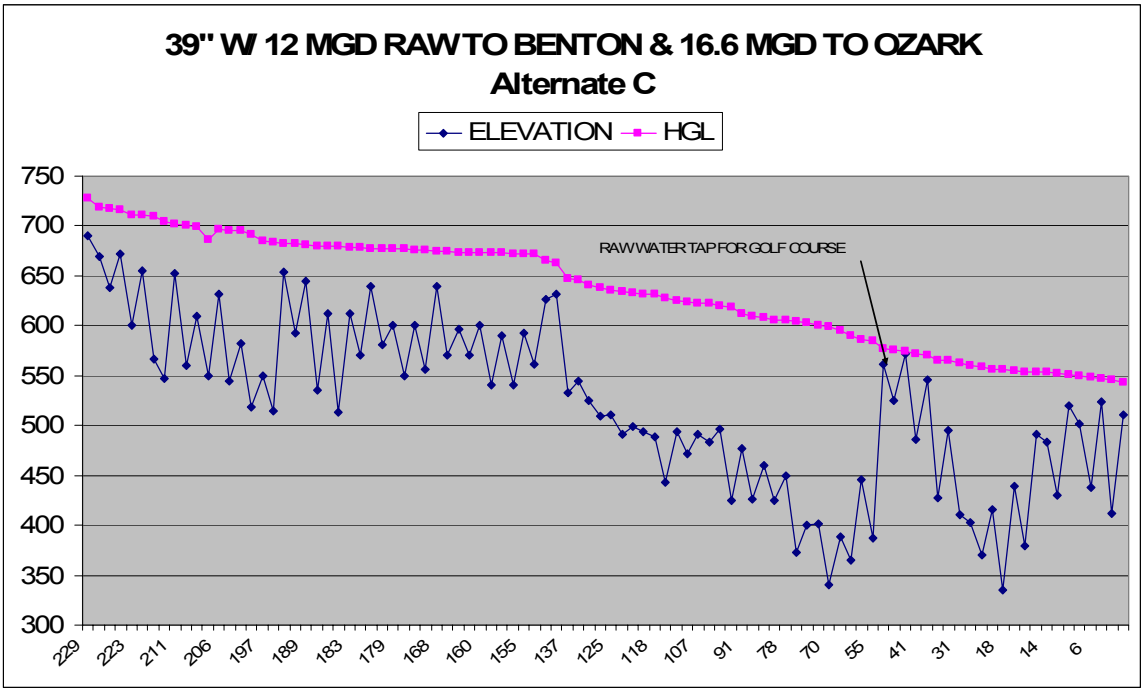
DESCRIPTION	SIZE	QUANTITY	UNIT	COST/UNIT	TOTAL
Parallel line on 39" @ Paron	42	32200	L.F.	$135.00	$4,347,000
Raw water line from Kanis/Denny roads to Benton plant	30	113600	L.F.	$100.00	$11,360,000
TOTAL EST. CONST. COST					$15,707,000
ENGINEERING		11	%		$1,727,770
R/W for pipeline		100	Ac.	$5,000.00	$500,000
CONTINGENCIES		10	%		$1,793,477
ADMIN. & LEGAL		1	%		$197,282
TOTAL ESTIMATED PIPELINE COST					$19,925,529

DESCRIPTION	QUANTITY	UNIT	COST/UNIT	TOTAL
12 MGD UPGRADE TO BENTON PLANT * - **	12 MGD			$9,000,000
ENGINEERING	11	%		$990,000
LAND ACQUISITION	40	Ac.	$15,000	$600,000
CONTINGENCIES	10	%		$1,059,000
ADMIN. & LEGAL	1%	%		$116,490
TOTAL				$11,765,490

* - first 6 MGD upgrade is based on rerating existing filters from 2gpm/sq. ft. to 3 gpm/sq. ft.

** - Next 6 MGD upgrade requires filters, basins, and clearwell

The cost is almost $2,000,000 more and, in addition, it causes two other problems that are evident in the graph below:



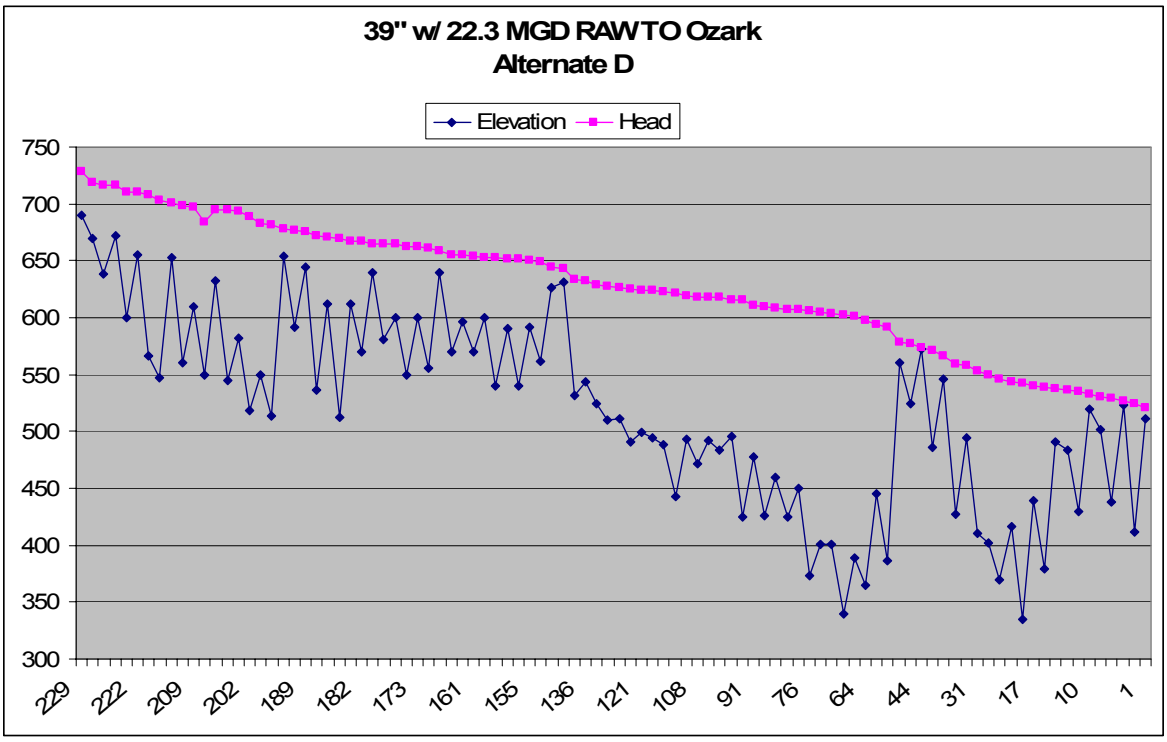
Since it is further East where the water is taken off, it reduces the flow that can be delivered to the Ozark Plant by another 1 MGD and, in addition, the tap on the Winona line is west of an existing raw water customer. It would be necessary for CAW to renegotiate the raw water contract with the Chenal Valley golf course to provide treated water. For this reason, Alternate C is not one that would be desirable to either party to this contract.

Alternative D

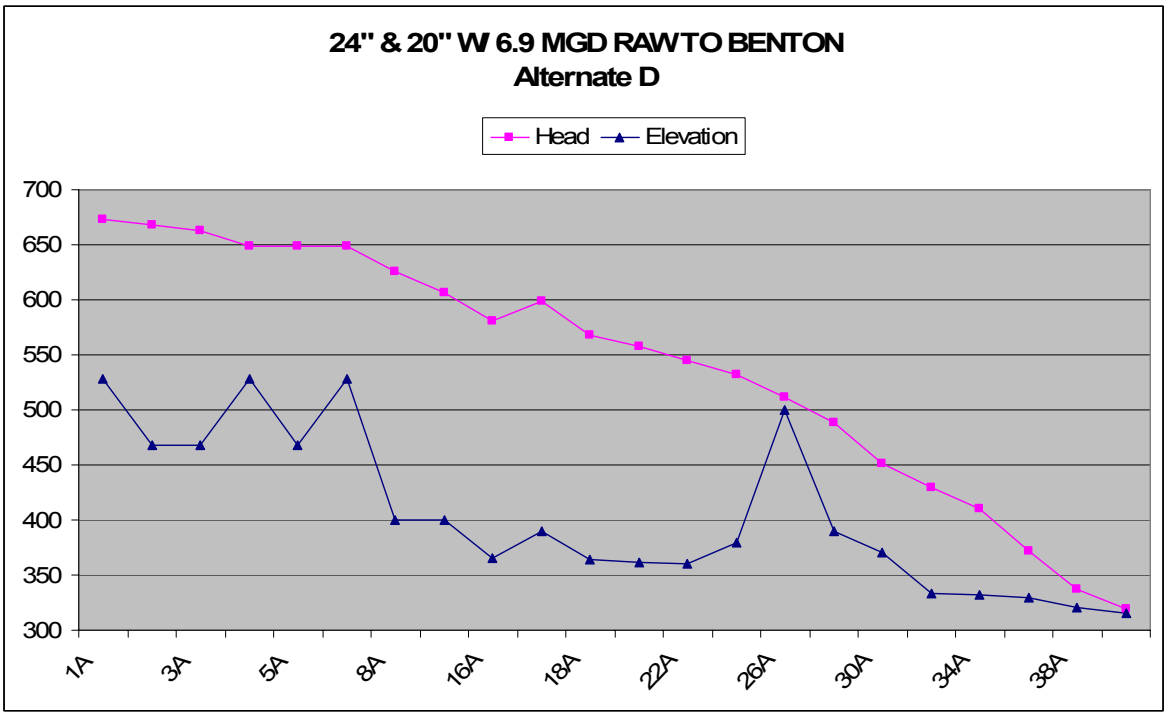
The previous alternatives were to provide 12 MGD of raw water to the Benton water plant. The fourth alternative should also be considered. That is to only deliver 6 to 7 MGD of raw water to the Benton Water Plant. There are several reasons for this:

1. Since the safe yield of Lake Winona is 27 MGD, based on hydraulic runs that were performed, 6 to7 MGD could be delivered to Benton and 22 MGD could continue on to the Ozark plant (except during severe drought conditions.
2. It would not require the 42" parallel line that is in the 3 other options.
3. The line from the Winona pipeline to the Benton water plant would be mostly 20" with some 24", not the 30" as required by the other alternatives
4. It might be possible to upgrade the Benton plant by 6 MGD, by installing one new sedimentation basin and hopefully getting the existing filters re-rated by the Arkansas Health Department. The following analysis reflects this possibility.

The 1st graph below shows the hydraulic profile on the existing 39":



This 2nd graph shows the hydraulic profile for the new water line to the Benton plant:



It can be seen that the hydraulic profile drops rapidly to almost nothing by the time it reaches the Benton plant. This is because most of this line is 20" and the velocity of the water at this 7 MGD is about 5 feet per second. Nevertheless, it does deliver the water needed.

The estimate for this option is as follows:

DESCRIPTION	SIZE	QUANTITY	UNIT	COST/UNIT	TOTAL
Raw water line from Winona line part way to Benton plant	24	24025	L.F.	$85.00	$2,042,125
Raw water line for remainder of way to Benton plant	20	79830	L.F.	$65.00	$5,188,950
TOTAL EST. CONST. COST					$7,231,075
ENGINEERING		11	%		$795,418
R/W for pipeline		71	Ac.	$5,000.00	$355,000
CONTINGENCIES		10	%		$838,149
ADMIN. & LEGAL		1	%		$92,196
TOTAL ESTIMATED PIPELINE COST					$9,311,839

DESCRIPTION	QUANTITY	UNIT	COST/UNIT	TOTAL
6 MGD UPGRADE TO BENTON PLANT *		6 MGD		$3,000,000
ENGINEERING	11	%		$330,000
LAND ACQUISITION	40	Ac.	$15,000	$600,000
CONTINGENCIES	10	%		$393,000
ADMIN. & LEGAL	1%	%		$43,230
TOTAL				$4,366,230

* - 6 MGD upgrade is based on rerating existing filters from 2gpm/sq. ft. to 3 gpm/sq. ft.

Update of cost to provide water from Lake Ouachita

The comments and estimate below are extracted from a report titled Preliminary Engineering Report, Water System Improvements, Benton, Arkansas, March 2002 by Affiliated Engineers, Inc.:

"The updated estimated cost for a 30 MGD raw water supply from Lake Ouachita is as follows":

30 MGD FROM LAKE OUACHITA - March 2002 estimate

DESCRIPTION	QUANTITY	UNIT	COST/UNIT	COST)
42" PIPELINE	221,000	42	$110	$24,310,000
INTAKE & PUMP STATION	1	EA	$3,000,000	$3,000,000
MISCELLANEOUS ITEMS		EA		$2,500,000
TOTAL EST. CONST. COST				$29,810,000
ENGINEERING	11	%		$3,280,000
R/W ACQUISITION	250	AC.	$4,400	$1,100,000
CONTINGENCIES				$2,400,000
ADMIN. & LEGAL				$410,000
TOTAL ESTIMATED PROJECT COST				**$37,000,000**

In order to bring this estimate to current cost, it has been updated by the Construction Cost Index in October 2005 and the pipe price was obtained by conversation with contractors and pipe suppliers. It should be noted that the price of Petroleum and steel has had a dramatic affect on pricing within the last year.

30 MGD FROM LAKE OUACHITA - October 2005 estimate

DESCRIPTION	QUANTITY	UNIT	COST/UNIT	COST
42" PIPELINE	221,000	42	$135	$29,835,000
INTAKE & PUMP STATION	1	EA	$3,500,000	$3,500,000
MISCELLANEOUS ITEMS		EA		$2,900,000
TOTAL EST. CONST. COST				$36,235,000
ENGINEERING	11	%		$3,985,850
R/W ACQUISITION	250	AC.	$5,000	$1,250,000
CONTINGENCIES	5	%		$2,898,800
ADMIN. & LEGAL	1	%		$443,697
TOTAL ESTIMATED PROJECT COST				**$44,813,347**

Finally, this estimate has been revised in order to compare it with Alternatives A, B and C above. This was done by looking at the head loss in a 42" pipe and then reducing the flow and pipe size until an equivalent head loss was obtained. From calculations made, a 30" pipe should carry 12 MGD. It should be noted that the intake cost was not reduced. This is because it would not be reasonable to build an intake that would last only 20 or 30 years, when you can install one that will last 100 years for a small incremental cost increase.

12 MGD FROM LAKE OUACHITA- October 2005

DESCRIPTION	QUANTITY	UNIT	COST/UNIT	COST
30" PIPELINE	221,000	30	$100	$22,100,000
INTAKE & PUMP STATION	1	EA	$3,500,000	$3,500,000
MISCELLANEOUS ITEMS	10	%		$2,560,000
TOTAL EST. CONST. COST				$28,160,000
ENGINEERING	11	%		$3,097,600
R/W ACQUISITION	250	AC.	$5,000	$1,250,000
CONTINGENCIES	5	%		$1,625,380
ADMIN. & LEGAL	1	%		$341,330
TOTAL ESTIMATED PROJECT COST				**$34,474,310**

It can be seen that the cost to install an intake and pipeline from Lake Ouachita for 12 MGD is almost double. This is because the pipe quantity is almost twice as much. In addition, under this option a pump station with annual power and O&M costs is required.

It should be understood, that an attempt was made to make each estimate in this section as similar as possible for purpose of comparison.

9. Problems and Resolution

At this point, it is good to go back to the UALR report and review some of the points made. First, it was pointed out that;

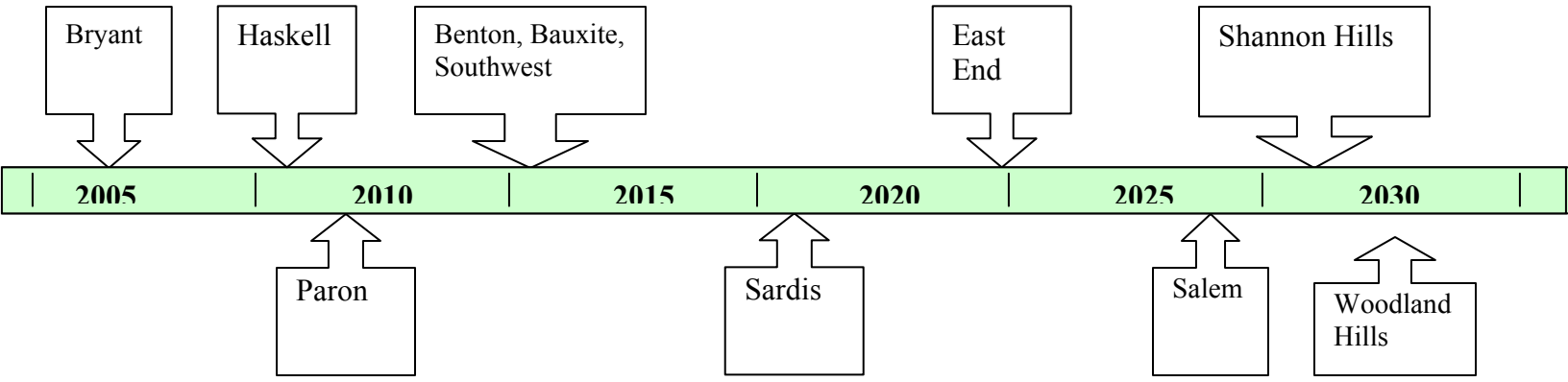
> *"Water is the issue of the 21st century; we need to be thinking 100 years down the road, not 50".*

Nothing could be more true. While political entities sometimes seem to think in terms of 2, 4 or 6 years, water purveyors must be thinking 50 and 100 years down the road. It takes time to design a project but as stated in the UALR report;

> *"The key to finding a solution to long-term reliable water supply for the citizens of Saline County, whether municipal or rural, was not in engineering, but in breaking down the human barriers that prevent communication and cooperation".*

While this may be true, it has been this author's observation that it is more a matter of money and long term commitment. What has been occurring in Saline County up until the formation of SWA, and even now, is that each system is still thinking about how they can solve their individual water problem. As an example of such, since the UALR report was published, Sardis, and Salem have signed contracts with CAW to buy water. Bryant is negotiating with CAW to buy additional water. Paron has been in contact with CAW about buying raw water.

The timeline below reflects each utilities need for additional water as it presently exists and bears studying closely to understand the problem.



You can see from the timeline about 6 of the 12 water entities need water in the next 10 years. Three- Bryant, Paron and Haskell, need it right now or within the next 5 years. Only two – Shannon Hills and Woodland Hills don't need any additional water based on existing sources. However, Shannon Hills does not have any backup supply, and Woodland Hills should also be concerned since they receive most of their water at this time from wells or from Bryant.

If Paron and Bryant work out their problems, then that would leave Benton, Bauxite, Haskell and Southwest to come up with a solution by themselves. That would then solve problems for a few years and then, Sardis would be looking again. What each entity has been doing is *hop scotching* each other. That is not what UALR recommended and it is shortsighted to continue in this vein**. The *cheap* water is drying up quickly** or to quote from UALR's report;

> *"When leaders negotiate with nearby water systems to buy water, they are at a disadvantage because of the relatively small number of customers served by each purveyor. Some face loss of autonomy over water. Fighting over water has continued to plague the relationships among cities and rural associations in the county, with legal costs draining already stretched resources. County leaders now look back in regret at how close the county had been to a long-term water solution back in 2002. Many of the county's problems could have been averted had there been the vision to create a regional water system for the county".*
>
> *"We must find a way to work together. None of us can afford to go for a long-term water source alone. This may be our last opportunity to find a way to cooperate".*

The question then becomes, how can you get leaders to work together?

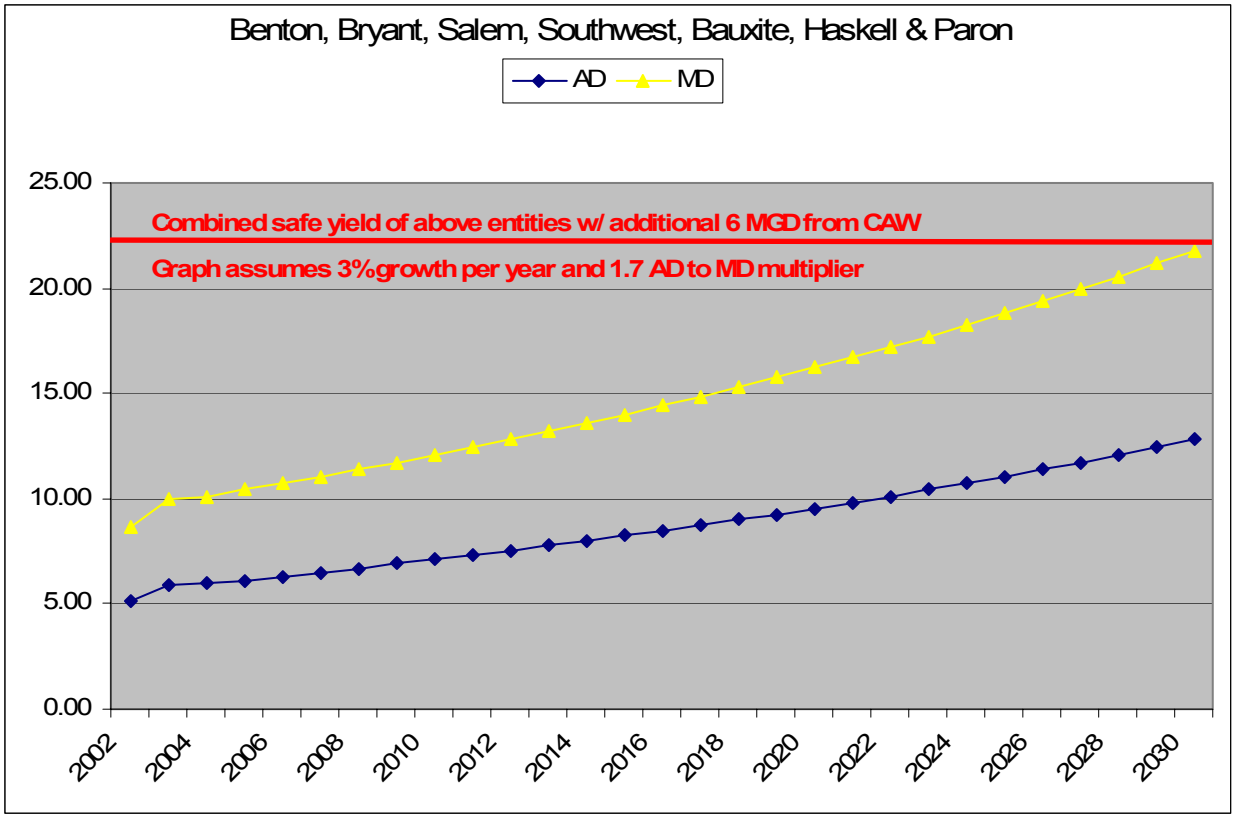
A significant first step was made when SWA was formed. In accordance with UALR the function of SWA was to be;

- *Seeking a long-term source of water to meet the watershed's projected needs for 50 years or more;*
- *Explore the feasibility and cost of a pipeline to Lake Ouachita as the first option;*
- *Be responsible for water treatment for the county. This could be accomplished either through taking over and expanding treatment facilities in Benton and Hot Springs Village to serve the district of by building a large new treatment facility;*
- *Sell water wholesale to existing water systems, which would continue to be responsible for water distribution to their current retail customer base;*
- *Sell treated water at the same wholesale rates to all purveyors who are part of the system;*
- *Sell bonds for infrastructure construction, to be repaid through water rates;*
- *Establish water rates that would pay for debt service and operation and maintenance of the system;*
- *Facilitate cooperation among water entities for extending service to individuals in the county not presently served by a water system;*
- *Hire and supervise a director; and*

- *Set all policies and procedures of the water distribution district*

While the first two bullets seem to be underway, none of the others are.

Regarding the water treatment for the county, and in light of Hot Springs' present position, Alternative D mentioned in Section 9 should go a long way in complying with this recommendation. It can be seen in the following graph that, based on 3% growth,



that if the Benton plant is expanded by 6 MGD now and then another 6 MGD by 2019 or 2020 then it alone should be adequate, along with the water that is already purchased from CAW by Bryant and Salem, to serve all of the entities above through 2030. If the treatment plant in Benton is to be expanded to provide this water, and if Bryant and Salem are to share their contract amounts, then it will be necessary for all of the above parties to come up with a method of sharing in the plant expansion and the water lines recommended in Alternative D.

It appears that there has been considerable contention among groups in the past regarding amounts charged for water. This was the same problem in Little Rock and North Little Rock, which lead to the merger of the two utilities. As a basis for determining a fair amount to charge for water and to determine how long it would take to levelize rates, it was recommended that a rate model be prepared based on **"cost of service with a regional rate approach".**

It is recommended that all members of SWA contract with a rate consultant that is experienced with this method and who can look at all rates charged by each member. It may be that the rates are fair now; they probably aren't. This rate study should clear the dust among members.

If this is done and if the above entities are agreeable to participating, then the funding recommendation in the UALR report should be fairly easy.

This does not however, address Woodland Hills, Shannon Hills, Sardis and East end. It is believed that they should participate in the cost of this study since they are a member of SWA. Also, since they are dependent on CAW, wells, and other entities for their source, it is recommended that they look at finding ways to connect their systems to each other so that water can be passed to each other in the event of emergencies. Redundancy is one of the keys to providing good clean water.

Also, while they don't need water when the other parties do, they should be looking forward. If they don't participate now, they will face the next water issue alone. And, it will get more difficult and expensive each time.

Finally, while it is out of the control of many of the parties in SWA, it is strongly encouraged that all parties define their service boundaries and those entities that are cities, should try to encourage city planners to agree with these service boundaries. It does not encourage participation when one city is trying to annex or take land that another city feels should be theirs. It is compounded when the property being taken or annexed is served by another water entity.

As part of this study the service boundaries, as best as can be understood, have been digitized and are included in Section 11.

10. Conditions that Relate to Report

a. Estimates

Estimates have been prepared in a format that is similar to that used by Affiliated Engineers since they have prepared previous reports and estimates for SWA as well as individual systems in Saline County.

Pipeline prices are based on average pricing from past projects as well as consultation with contractors. It should be widely recognized that the cost of steel and petroleum has increased significantly in 2005. It is uncertain whether this trend will continue. In addition, no design has taken place. If unknown environmental issues relating to the river basin come to light, the cost could increase considerably. Based on verbal information received from two different sources, at this time, it is hopeful that this will not be the case.

Likewise, land pricing is based on pricing used by Affiliated Engineers for similar projects and does not reflect any appraisals.

Treatment plant pricing for the Benton Water Plant is conditioned upon the existing filters being re-rated from 2 gpm/sf to 3 gpm/sf. It does not take into consideration any pumping that may be required between the plant and Chenault reservoir. Likewise, additional treatment modifications may be required due to conditions that are unknown at this time. If Lake Winona water is delivered to the plant:

- It is recommended that a "treatability study" be completed before design of plant expansions. Winona water quality information is given below.

b. Winona Intake

As noted in the report, the Winona intake and pipeline is 70 years old. While it has performed well with almost no down time, it cannot be expected to continue for 20 or 30 more years without maintenance. This will mean that alternative sources are wise. The commitment to MAWA is a good step in this direction. As stated previously, water purveyors need to think 50 to 100 years into the future.
It is the understanding of this author that CAW intends to perform a thorough inspection of the Winona intake this year. If intake repairs are needed, they should be performed in the off peak months.

Lake Winona Water Quality

Per a study completed for CAW in 1996- Burns and McDonnell, Compliance Assessment:

"Lake Winona water has more aquatic humic substances than Lake Maumelle. The fulvic acids are the predominant component of the humic substances. A greater percentage of fulvic acids is also noted in Lake Winona water".

Below is data extracted from that report:

CHARACTERIZATION OF ORGANIC MATTER IN CAW SOURCE WATER

Source	Organic Component	Concentration mg C/L
Lake Winona	Dissolved Organic Carbon	3.71
	Humic Materials	3.70
	Fulvic Acids	3.16
	Humic Acids	0.55

In addition, it is characterized as very soft, low alkalinity, low turbidity water, with pH ranges of 5.5 - 7.0. Total Organic Carbon in Lake Winona over the past five years has averaged 3.0 mg/L with a minimum of 2.1 mg/L and maximum of 5.5 mg/L.

Water Quality Reports for CAW from 2000 to 2004 are also available on their Web Site at: www.carkw.com.

c. Hydraulic conditions

All hydraulic runs were made with Lake Winona water level at 730 feet above sea level (MSL). This is 10 feet below overflow. The lake normally fluctuates between overflow and minus 8 feet. To understand this relationship, in 1986 it dropped to 17 feet below overflow. In 2000 it dropped to 14 feet below overflow and so far this year it is at 10.4 feet below overflow. Typically, in June, July and August it could be expected to be above this level, and in the fall when demands have been high and rainfall is less, you should expect to see it drop below this minus 10 foot level. If additional water over the 24 MGD is consistently taken then it could be expected to normally drop below minus 10 feet.

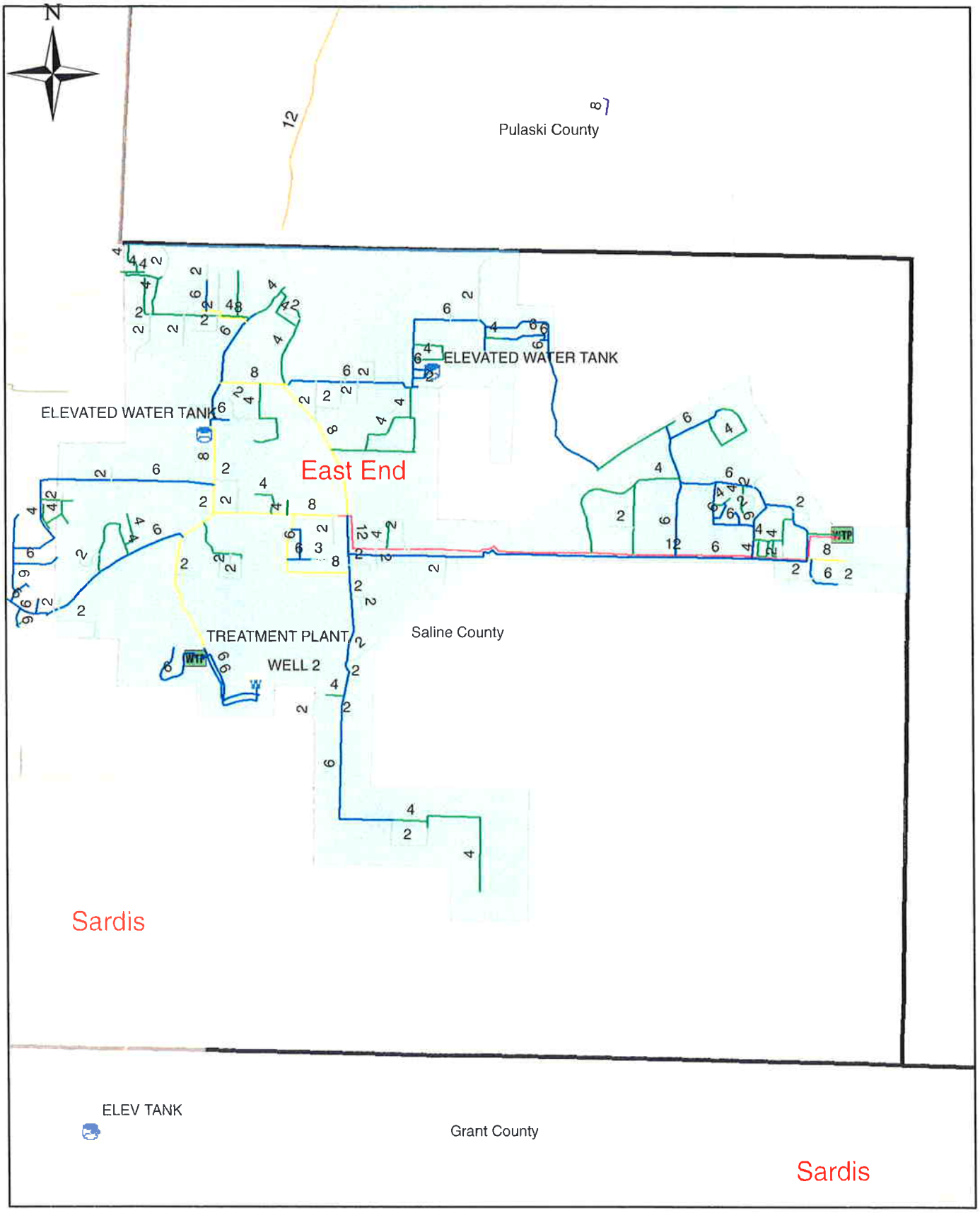
As long as the water level is at 730 MSL or above, the hydraulics shown in this report will be reasonable. When the level drops below 730 MSL then less water will be delivered. How much less would be a function of how much the level drops and how clean the pipelines are kept.

11. Service Boundaries

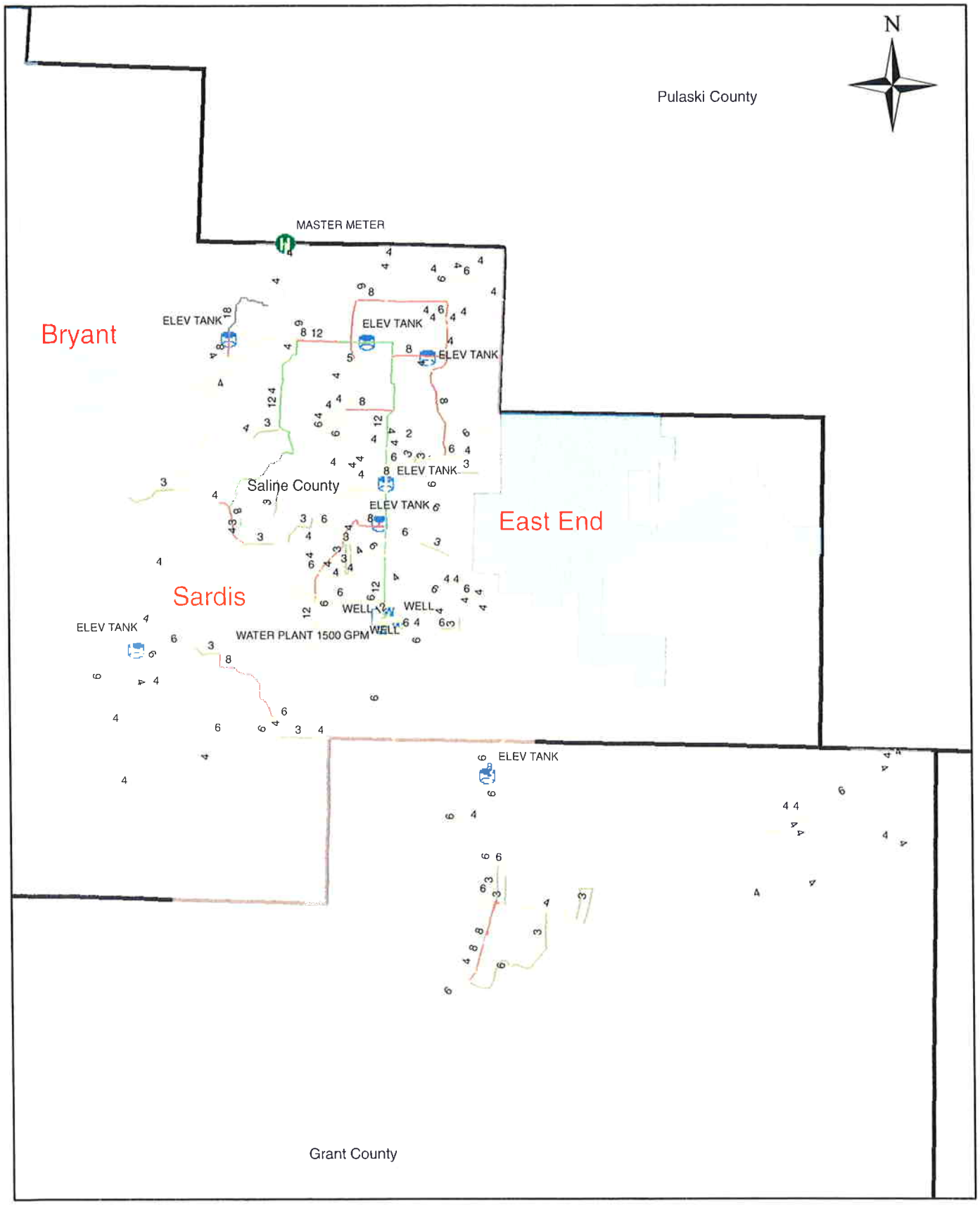
The following maps represent service boundaries, tanks, pumps, meters and water lines for each system. Not all entities provided information regarding their infrastructure. Those that did, have been mapped in GIS format. This information is available in digital form and/or can be printed in almost any size. If requested, ground contours can also be provided.

At this point in time, there is little doubt that some of the service boundaries still need adjusting. It might not be possible to do so until disputes between some of the cities/entities are resolved. If any member of SWA notes any glaring errors in these maps, corrections will be provided.

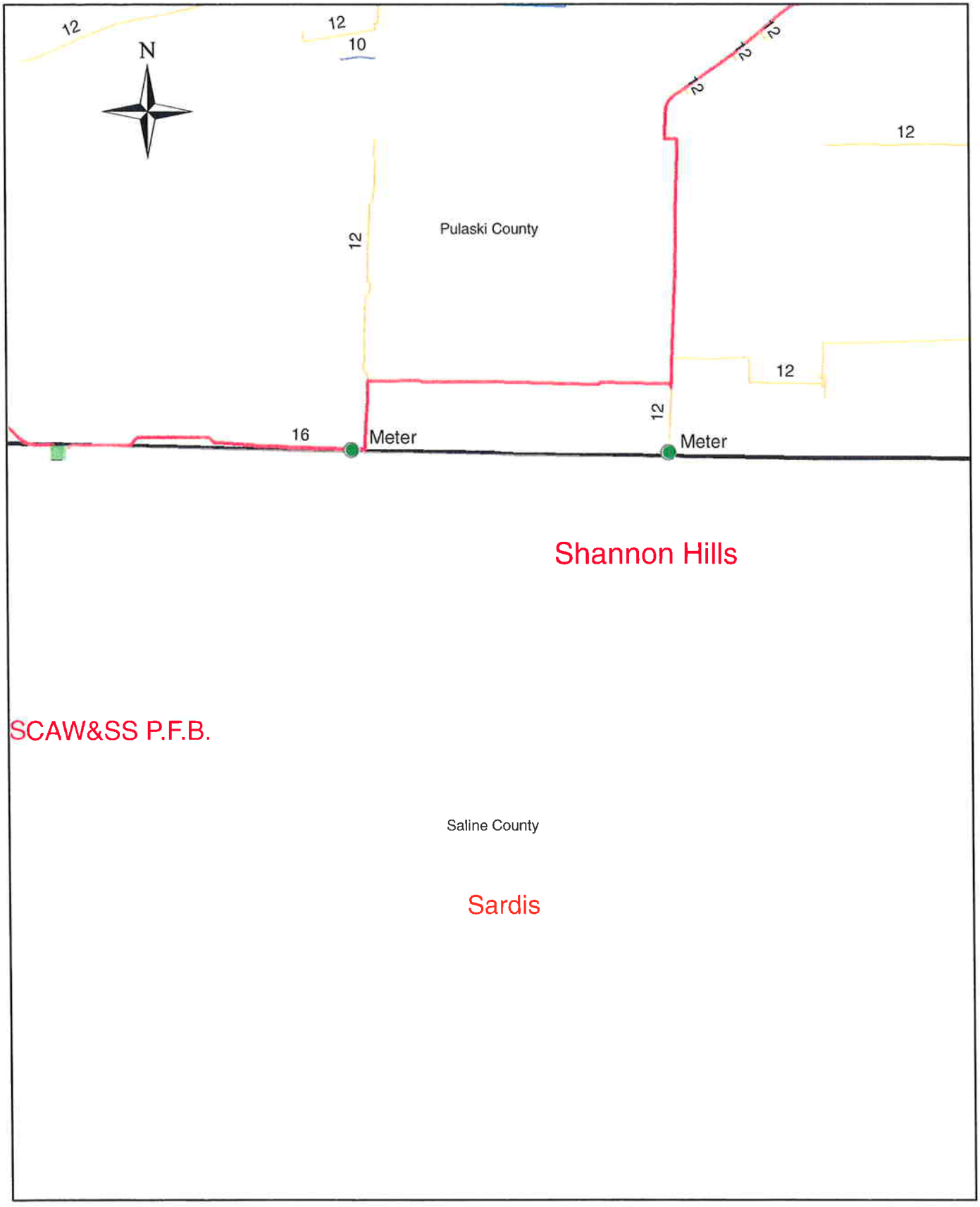
In addition, a copy of all mapping coverage's (in electronic format) has already been provided to Metroplan. If there are corrections/additions, these will be made and a final copy will be delivered to Metroplan.



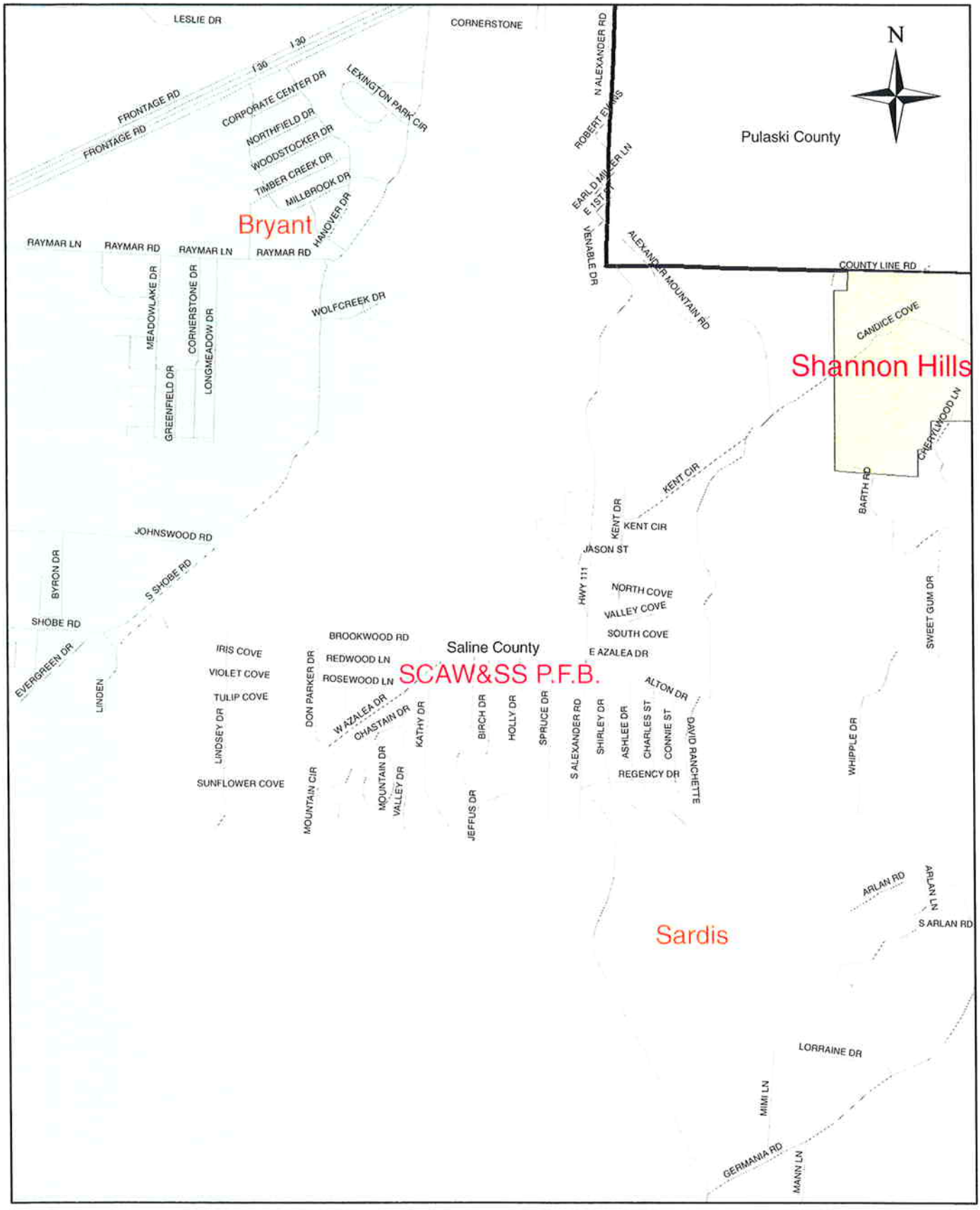
East End Water System



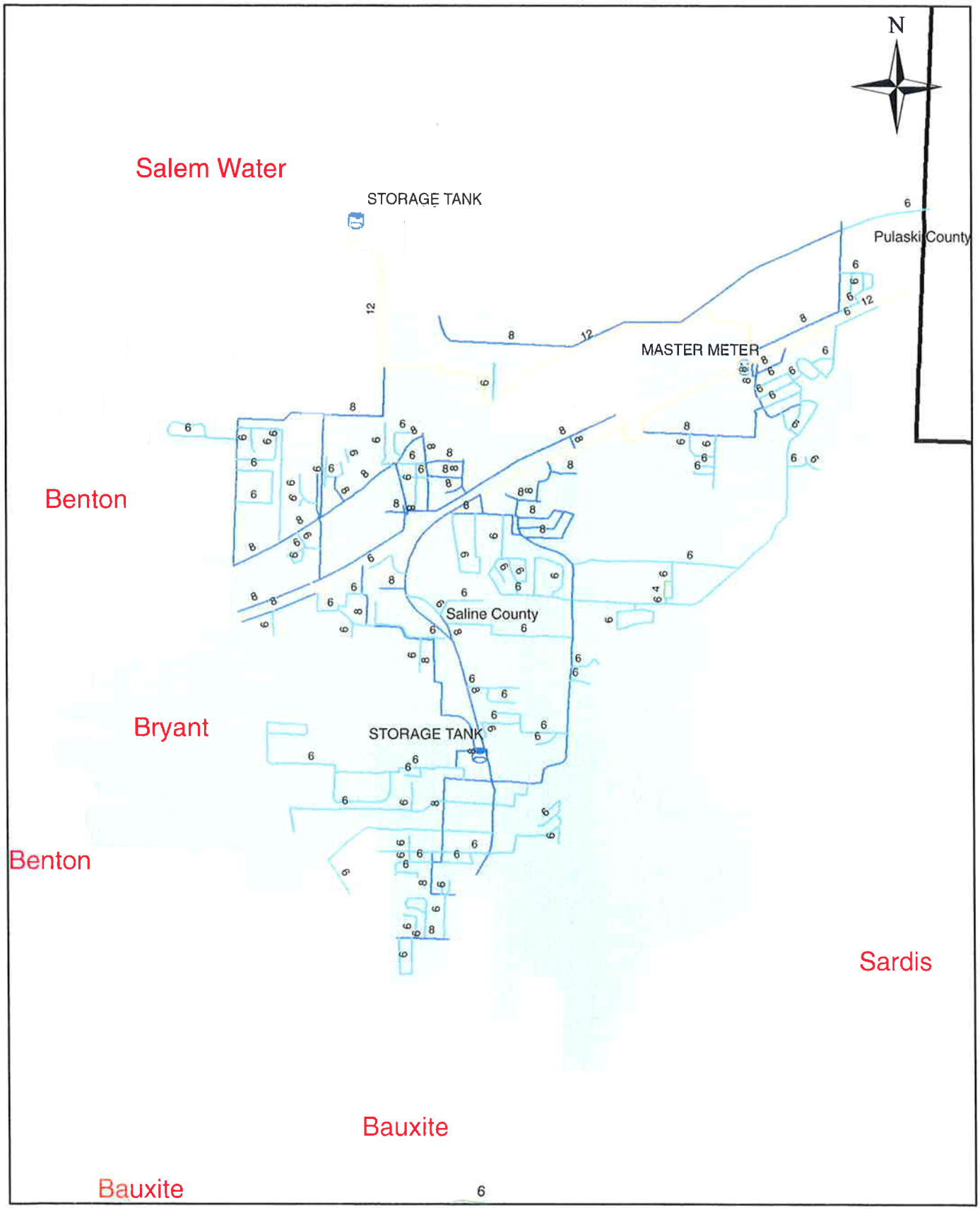
Sardis Water System



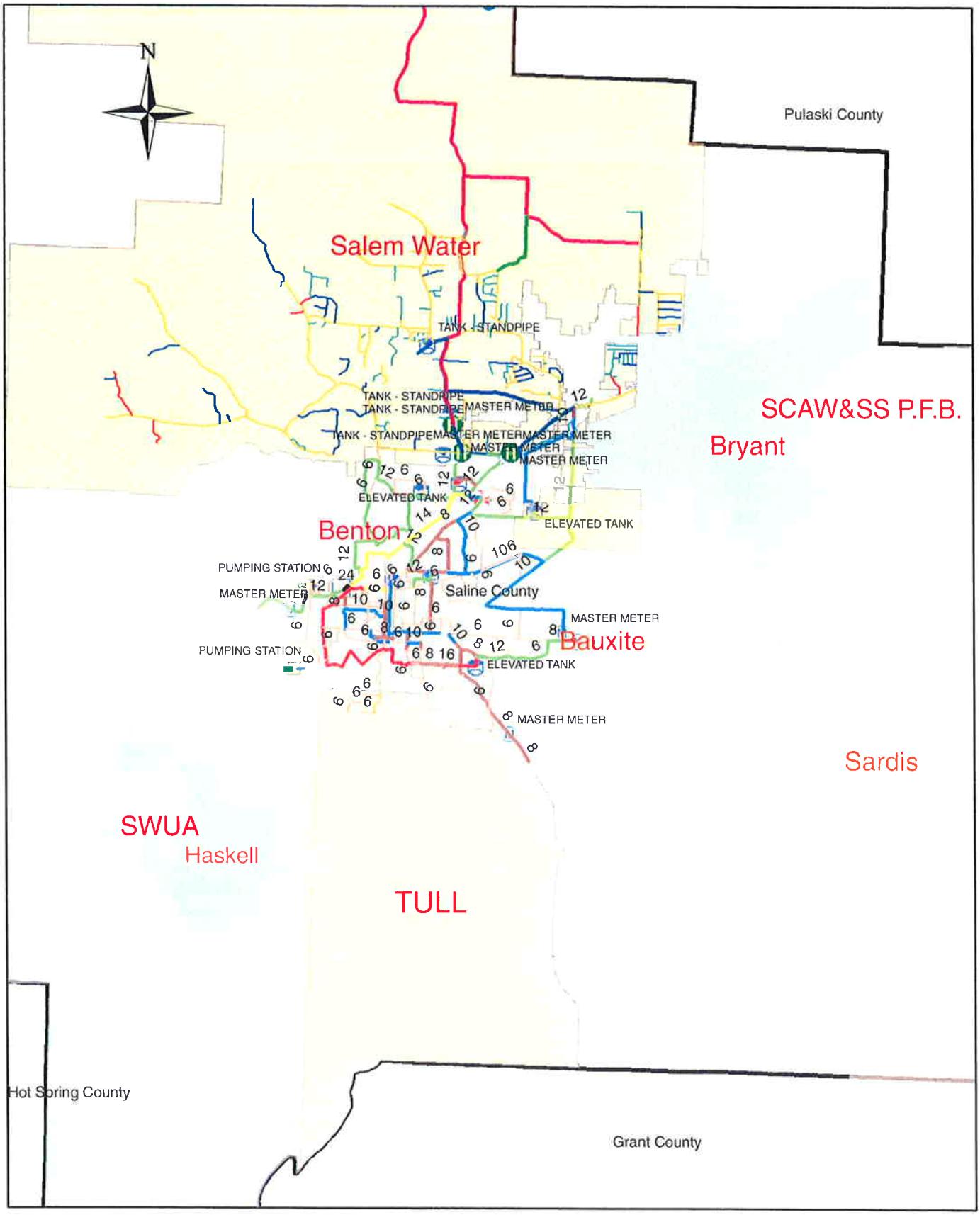
Shannon Hills Water System



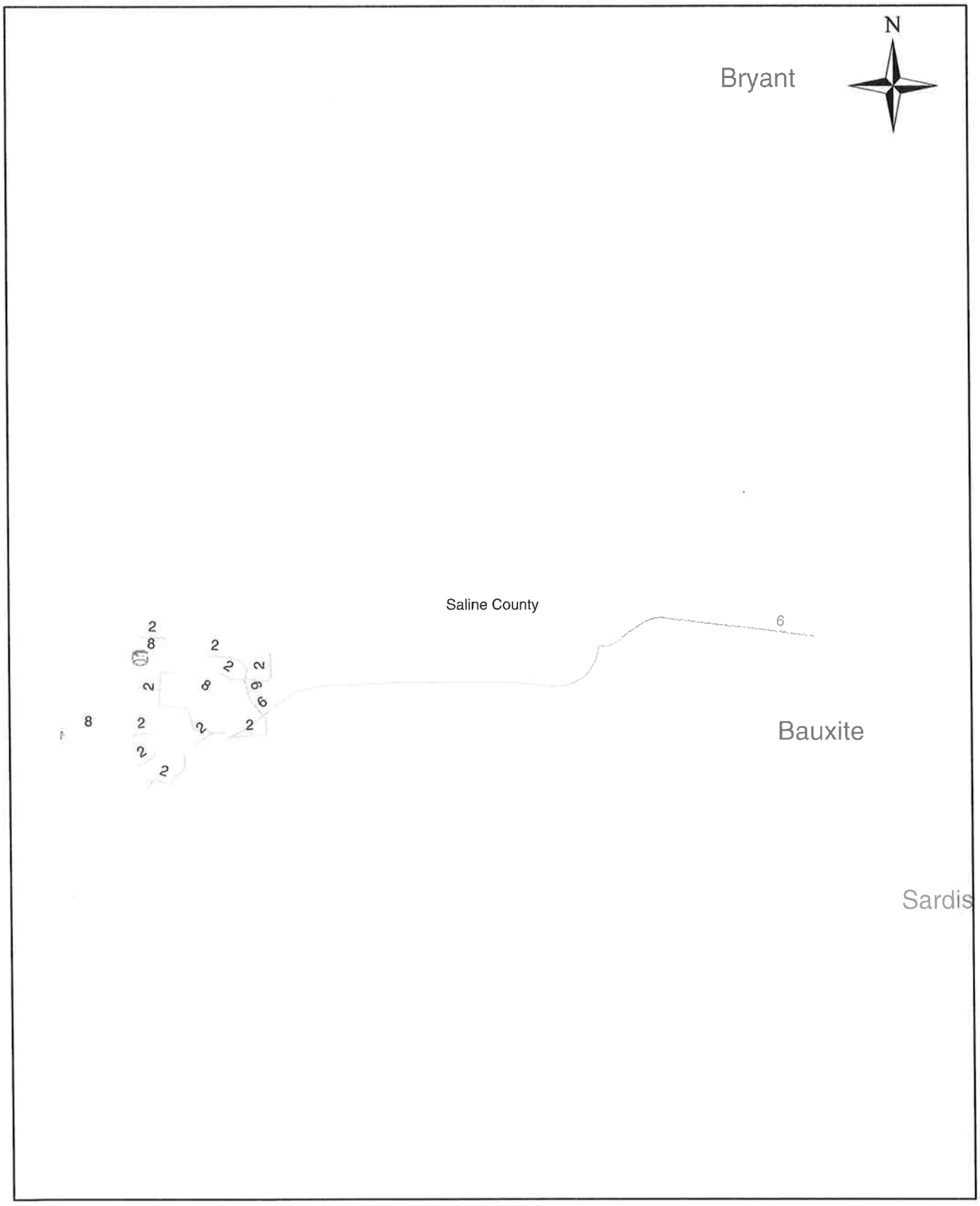
SCAW&SS P.F.B. Water System



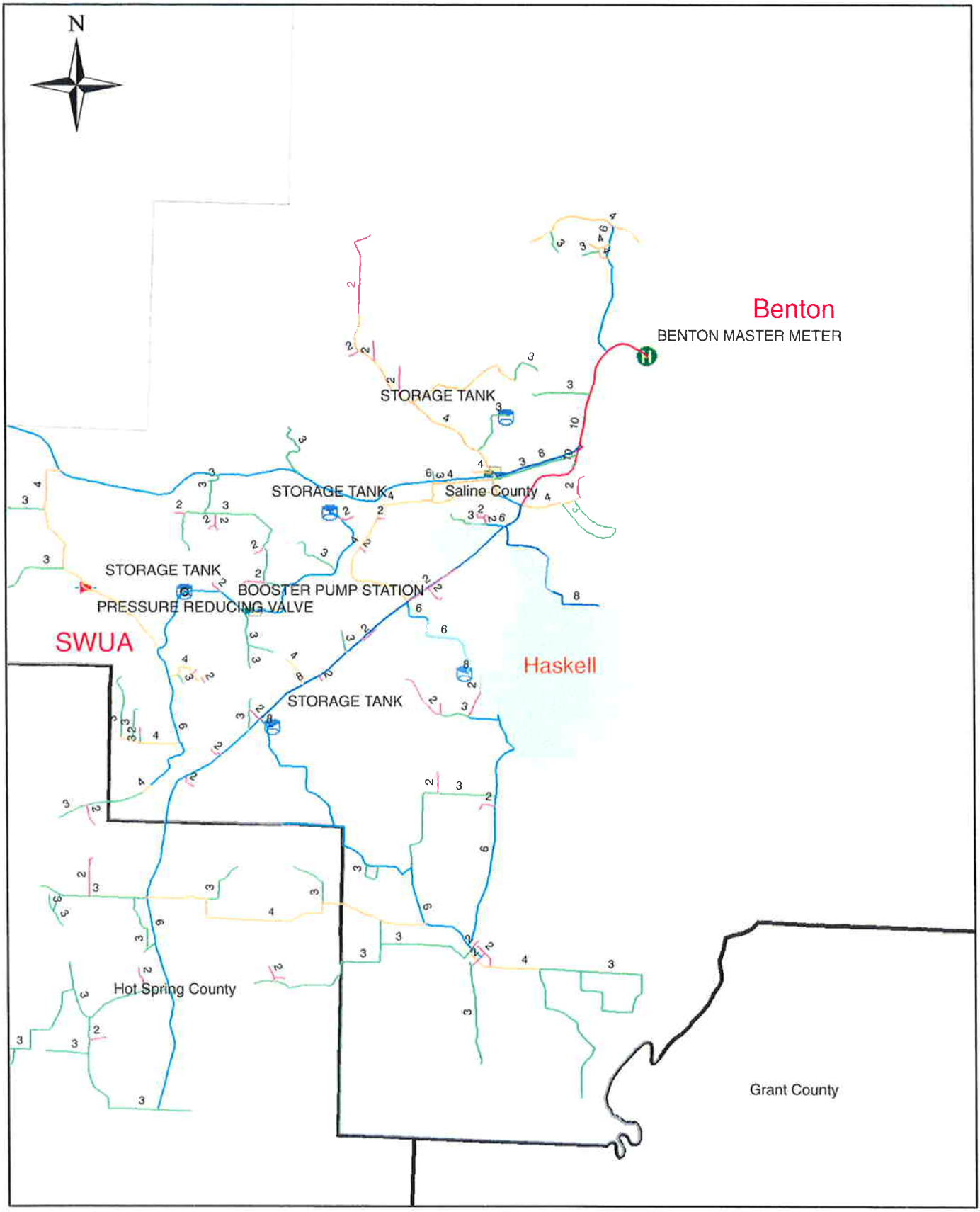
Bryant Water System



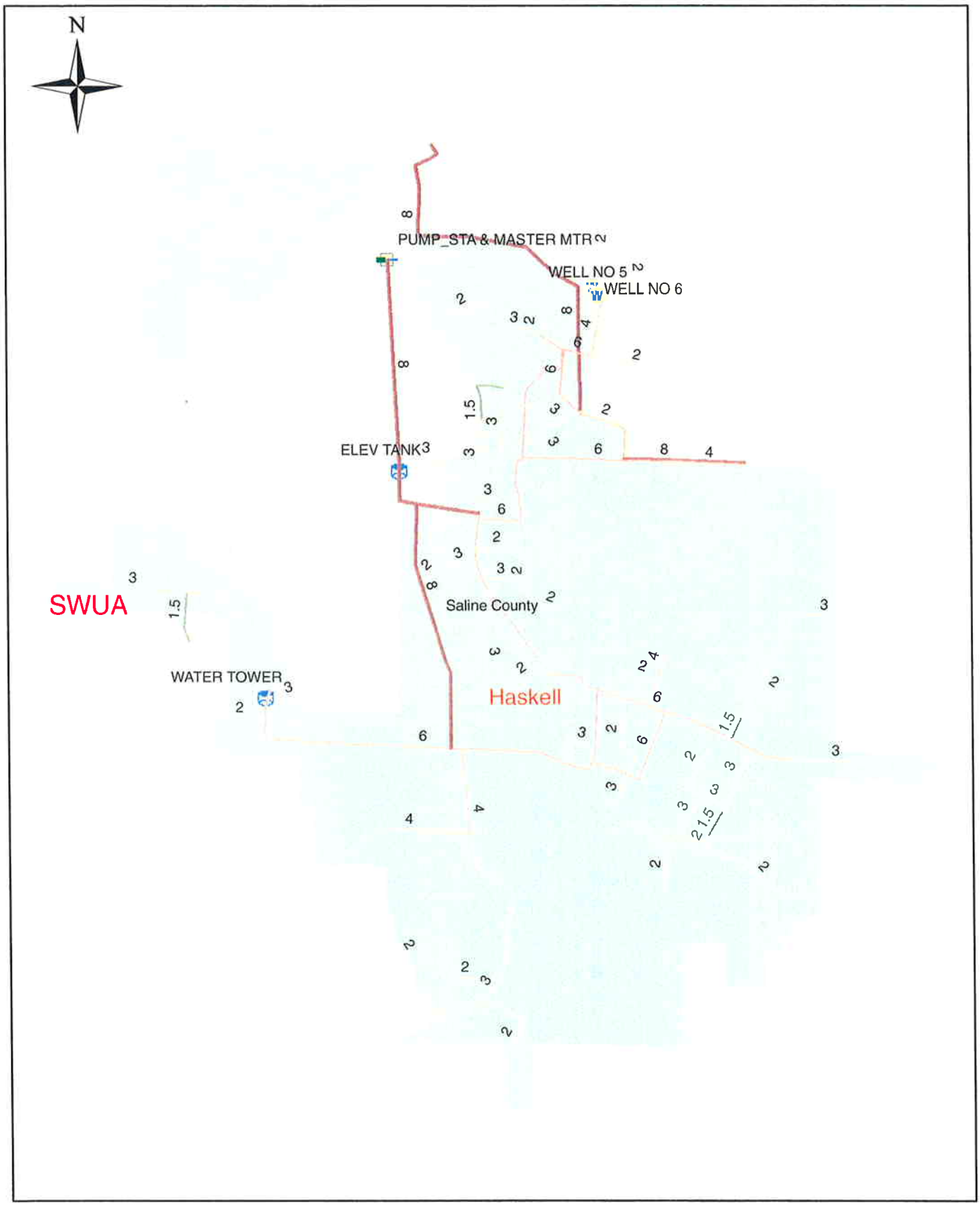
Benton/Bauxite/Tull Water System



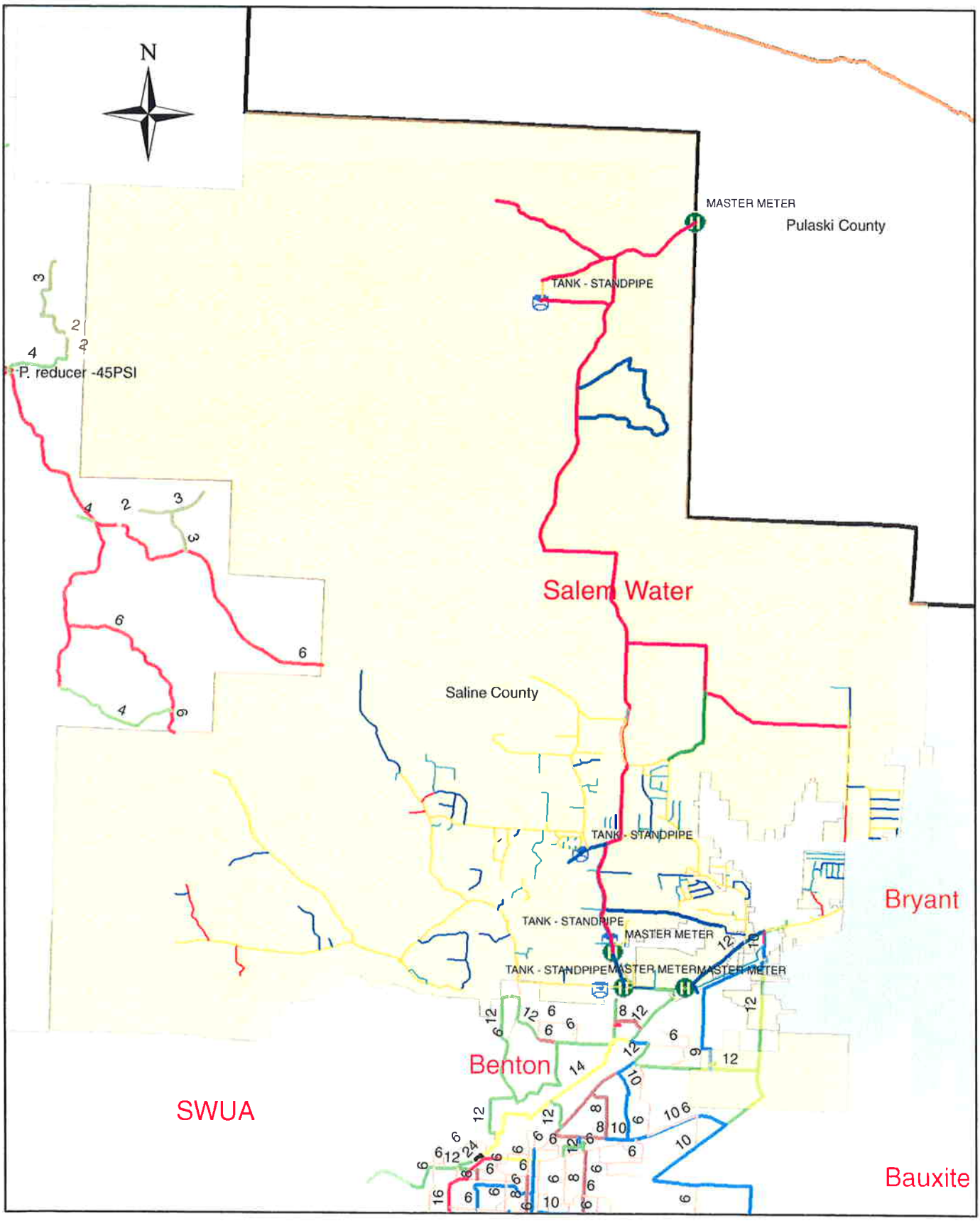
Bauxite Water System



Southwest Water System

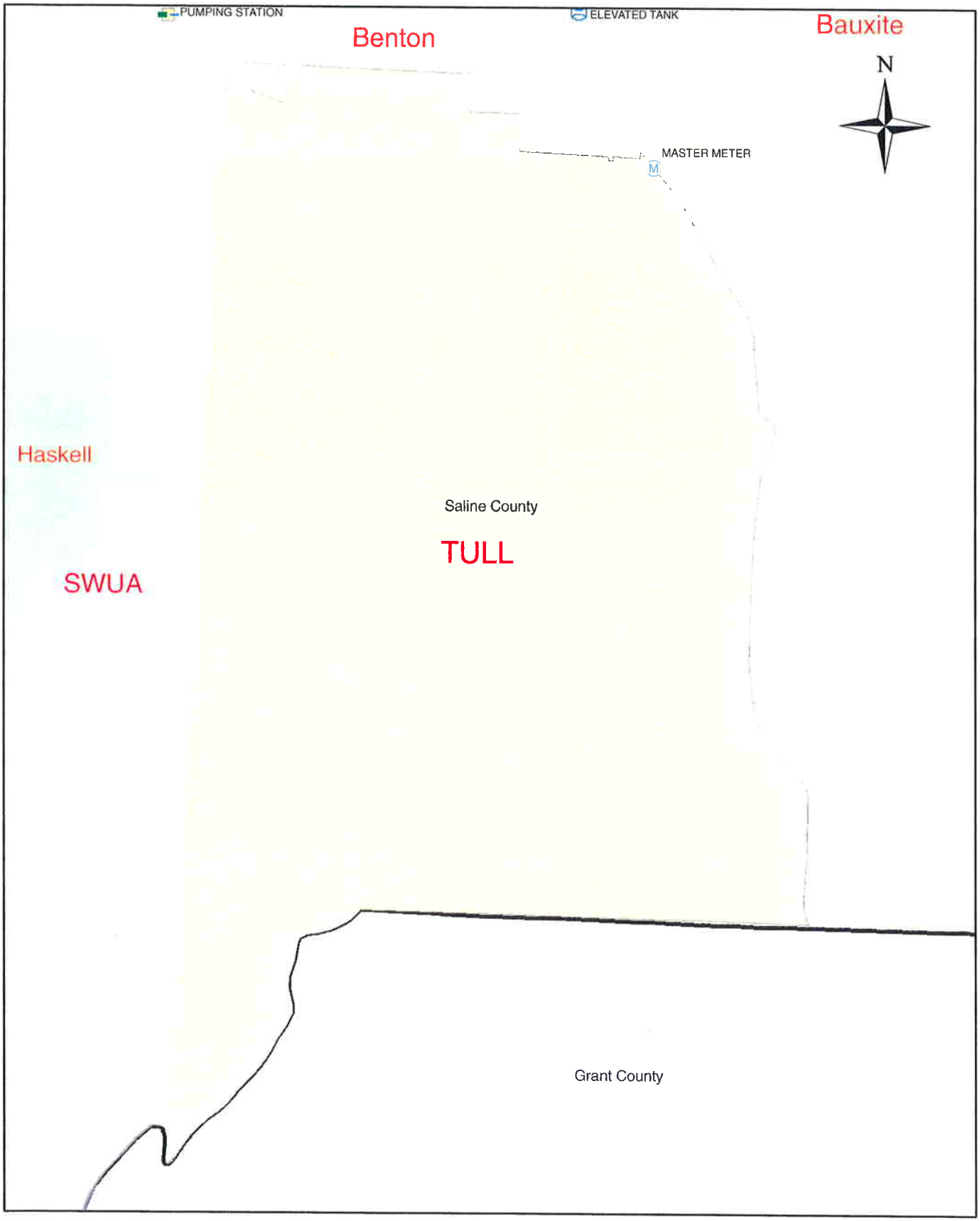


Haskell Water System



Salem Water System

Paron Water System



Tull Water System